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THE NAVAL ANNUAL

LORD BRASSEY

K.C.B.

FIFTH YEAR OF PUBLICATION

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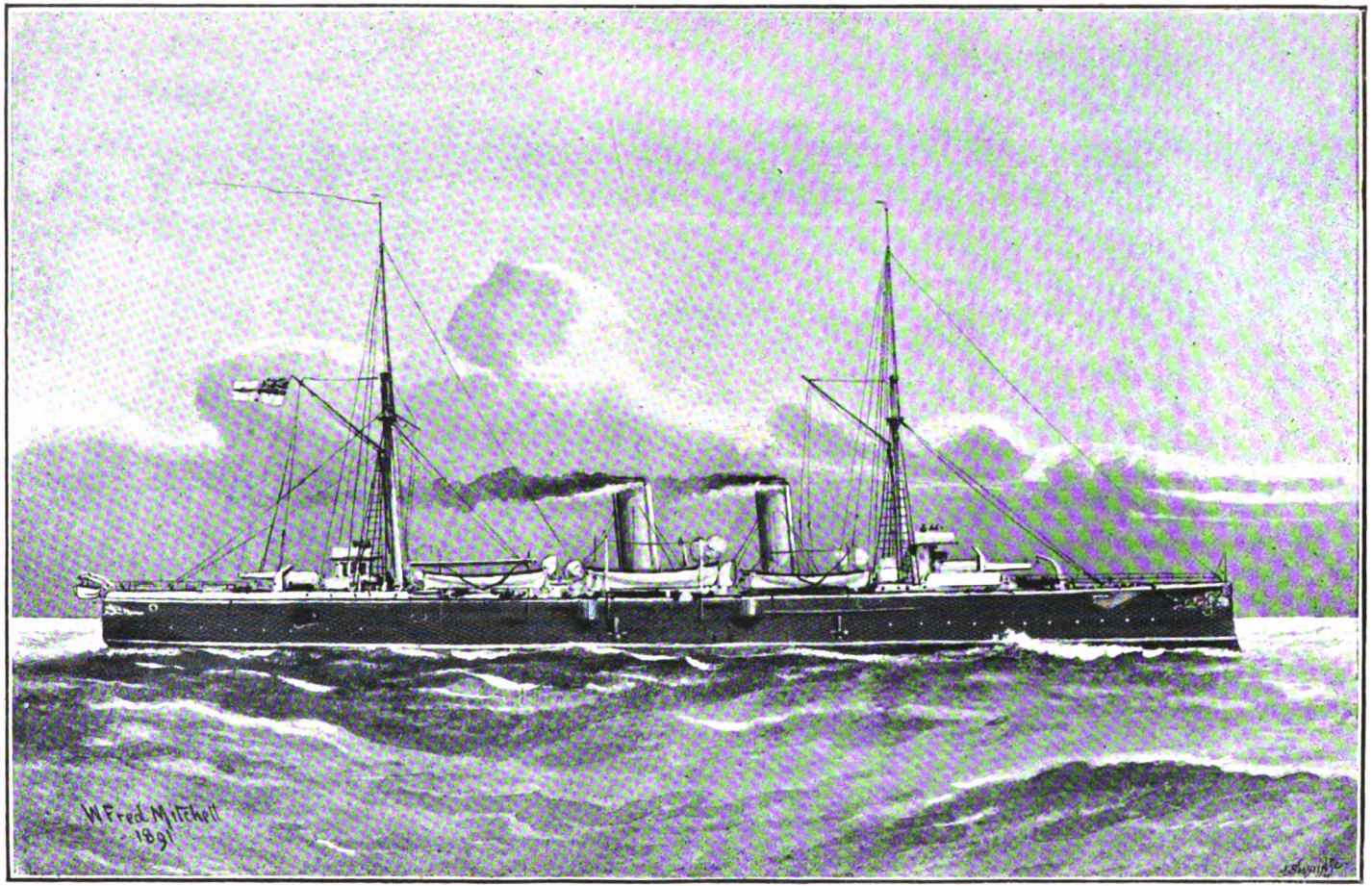

"KATOOMBA."
AUSTRALIAN PROTECTED CRUISER.

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THE

NAVAL ANNUAL,

1891.

EDITED BY

T. A. BRASSEY, B.A., F.R.G.S.

PART I.—LORD BRASSEY, K.C.B., M.A., D.C.L., Commander of the Legion of Honour.

PART II.—F. K. BARNES, Esq., M.I.N.A.

PART III.—Captain ORDE BROWNE, late R.A., Lecturer on Armour to R.A. College.

PART IV.—STATISTICS, TABLES, OFFICIAL REPORTS.

"He that commands the sea is at great liberty, and may take as much and as little of the war as he will. Whereas those that be strongest by land are nevertheless many times in great straits. Surely, at this day, with us of Europe, the vantage of strength at sea (which is one of the principal dowries of this kingdom of Great Britain) is great; both because most of the kingdoms of Europe are not only inland but girt with the sea most part of their compass, and because the wealth of both Indies seems, in great part, but an accessary to the command of the seas."

BACON. (*The True Greatness of Kingdoms.*)

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PREFACE.

As in previous years, so, in putting forth a fifth number of the NAVAL ANNUAL, it is the first duty of the compiler to express his obligations to those well-informed and diligent writers who are content to labour anonymously as contributors to the public press.

While nothing new is here presented, all the materials being drawn from official publications, periodicals, and newspapers, it may be claimed that no pains are spared to make the NAVAL ANNUAL a complete and convenient record and work of reference. The task of the editor is conducted under a real sense of responsibility to a numerous body of readers, among whom are included powerful sovereigns as well as cadets of the Britannia. The sight of well-thumbed copies of the ANNUAL in the library of our great Naval School was a special encouragement to the compiler to continue his labours.

In the hope of effecting further improvements, it is in contemplation in future years to secure the co-operation of various writers, at home and abroad, who will deal with the branches of administration in which they are most competent. The NAVAL ANNUAL is already greatly indebted to Captain Orde Browne, in the department of gunnery. It is proposed to entrust other chapters to specialists in their several lines. Mr. Barnes has spared no pains on the Tables.

Events are frequent in the sphere with which this volume deals. Since the first sheets were sent to press, the Naval Exhibition has been opened, and the Blanco Encalada has been sunk. It is difficult to resist the temptation to enlarge on both of these incidents. The Naval Exhibition cannot fail to be an object-lesson, deeply interesting, and of enduring value to the British people. It is a record and epitome of our naval history. It reminds us of the great and glorious deeds by which our Empire has been built up. If we would maintain that Empire, we must stand prepared to repeat the achievements of our forefathers.

The sinking of the Blanco Encalada may be quoted as a new and impressive illustration of the dangers to which the most formidable

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ironclads are exposed. It is an argument in favour of the policy of building ships of moderate dimensions.

The present issue of the ANNUAL makes its appearance at a time when the naval defences of the British Empire are more fully assured than they have been for many years past. In measuring our strength in comparison with other nations, we cannot put aside the great resources we possess outside the Navy. Elasticity in finance is a main element of power. In this regard Great Britain has a conspicuous advantage. France, our most powerful rival upon the seas, has been burdened with a huge expenditure on preparations for war, which during the past twenty years has amounted to no less than £600,000,000. The public debt of Russia is £576,692,000; that of Italy, £449,263,000.

To depend upon material resources alone would be fatal indeed; but who shall doubt that in any crisis of the future our strength will be wielded with the spirit, the tenacity, and the ability which have been displayed in the past? Serenity in danger is characteristic of the British nation. It is shown by all classes of the people; by the most luxurious, in the hunting field; by the humblest, on the deck and in the mine.

In the brief chapter on Foreign Policy, the situation in Egypt has been discussed solely from the point of view of Imperial defence. The compiler fully recognises the political considerations which render it difficult, and at the present time impossible, to abandon a task which has certainly not been undertaken with selfish aims or for the promotion of British interests.

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CONTENTS.

PART I.

CHAPTER I.

PAGE

THE YEAR 1890 1–10

CHAPTER II.

ENGLISH NAVAL MANŒUVRES, 1890 11–32

CHAPTER III.

FOREIGN NAVAL MANŒUVRES, 1890 33–42

CHAPTER IV.

BOARD OF ADMIRALTY 43–48

CHAPTER V.

ADMINISTRATIVE EFFICIENCY 49–58

CHAPTER VI.

INFLUENCE OF NAVAL POWER IN MODERN TIMES 59–63

CHAPTER VII.

TRAINING AND EDUCATION 64–77

CHAPTER VIII.

FOREIGN POLICY 78–82

CHAPTER IX.

COALING STATIONS 83–86

CHAPTER X.

THE NAVAL DEFENCE ACT 87–96

CHAPTER XI.

FUTURE POLICY OF WAR-SHIP BUILDING 97–117

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CHAPTER XII.

PAGE
DESCRIPTIONS OF SHIPS RECENTLY COMPLETED, AND IN HAND, TRIALS, &c. 118–146

CHAPTER XIII.

INFLUENCE OF SEA-POWER ON HISTORY 147–151

PART II.

TABLES AND PLANS OF BRITISH AND FOREIGN ARMOURED AND UNARMOURED SHIPS.

PART III.

ARMOUR AND ORDNANCE.

PART IV.

STATISTICS, OFFICIAL STATEMENTS AND PAPERS.

BRITISH NAVAL ESTIMATES 351–375
REPORT ON ROYAL NAVAL RESERVE 376–378
EXPLANATORY OBSERVATIONS ON THE NAVY ESTIMATES 379, 380
NAVY ESTIMATES FOR THE YEAR 1891–92 381–390
PROGRAMME OF SHIPS BUILDING IN HER MAJESTY'S DOCKYARDS, AND BY CONTRACT 391–400
NEW CONSTRUCTION, EXPENDITURE, &c. 401–430
FRENCH NAVAL ESTIMATES 431–449
ITALIAN ESTIMATES, 1891–92 .. .. 450, 451
GERMAN NAVY ESTIMATES, 1891–92 452–455
RUSSIAN NAVY ESTIMATES, 1891 456
REPORT OF THE SECRETARY OF UNITED STATES NAVY 457–464
INDEX 465

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LIST OF ILLUSTRATIONS.

Katoomba (Australian Protected Cruiser) . . . . *Frontispiece.*
Maine (American Armoured Cruiser) . . . . . *page* 4
Isly (French Protected Cruiser) . . . . . „ 53
Pamyat Azova (Russian Armoured Cruiser). . . . . „ 94

MAP AND DIAGRAM.

	PAGE
Map of the World * (showing Coaling Stations and Trade Routes) . .	84
Diagram showing the Expenditure upon the Construction of New Ships in the financial years 1869-70 to 1891-92, both inclusive . . .	430

SHIPS (PART II).

GREAT BRITAIN.

	PLATE		PLATE
Æolus	3	Edgar class	15
Agamemnon	2	Edinburgh	11
Ajax	2	Endymion	15
Alexandra	1	Forth	23
Andromache	3	Galatea	4
Anson	10	Gibraltar	15
Apollo class	3	Glatton	14
Aurora	4	Gorgon	9
Australia	4	Grafton	15
Barfleur	8	Hawke	15
Belleisle	6	Hecate	9
Benbow	5, 6	Hercules	16
Blake	7	Hero	12
Blenheim	7	Hood	17
Brilliant	3	Hotspur	18
Camperdown	10	Howe	10
Centurion	8	Hydra	9
Cerberus (Colonial Marine)	9	Immortalité	4
Collingwood	10	Impérieuse	19
Colossus	11	Indefatigable	3
Conqueror	12	Inflexible	20
Crescent	15	Intrepid	3
Cyclops	9	Iphigenia	3
Devastation	13	Katoomba (Australian Cruiser)	21
Dreadnought	14	Latona	3

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GREAT BRITAIN—*continued.*

	PLATE
Magdala (Indian Marine)	9
Magicienne	22
Marathon	22
Medea	22
Medusa	22
Melampus	3
Melpomene	22
Mersey class	23
Mildura (Australian Cruiser)	21
Naiad	3
Narcissus	4
Nelson	24
Neptune	24
Nile	30
Northampton	24
Orion	6
Orlando	4
Pique	3
Rainbow	3
Ramillies	25
Renown	25
Repulse	25
Resolution	25
Retribution	3
Revenge	25
Ringarooma (Australian Cruiser)	21
Rodney	10
Royal Arthur (late Centaur)	15
Royal Oak	25
Royal Sovereign class	25
Rupert	18
Saint George	15
Sans Pareil	26
Sappho	3
Scylla	3
Severn	23
Shannon	27
Sirius	3
Spartan	3
Sultan	28
Superb	28
Swiftsure	29
Sybille	3
Tauranga (Australian Cruiser)	21
Téméraire	29
Terpsichore	3
Thames	23
Theseus	15
Thetis	3
Thunderer	13
Trafalgar	30
Tribune	3
Triumph	29
Undaunted	4
Victoria	26
Warspite	19
Wallaroo (Australian Cruiser)	21

FOREIGN.

ARGENTINE REPUBLIC.

Almirante Brown	31

AUSTRIA.

Custoza	32	Tegetthoff	33
Don Juan de Austria	32		

BRAZIL.

Riachuelo	34

CHILI.

Captain Prat	35	Esmeralda	36

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FOREIGN—*continued.*

CHINA.

	PLATE		PLATE
Chen-Yuen	37	Ting-Yuen	37

DENMARK.

Gorm	38	Iver Hvitfeld	39
Heligoland	38		

FRANCE.

Acheron	51	Fusée class	51
Alger	55	Grenade	51
Amiral Baudin	40, 41	Hoche	52
Amiral Duperré	42	Indomptable	46
Bombe	56	Isly	58
Bouvines	45	Jean Bart	58
Bruix class	44, 45	Jemmapes	43
Caiman	46	Lance	56
Chanzy	44, 45	Latouche-Tréville	44, 45
Charnier	44, 45	Magenta	52
Cocyte	51	Marceau	52
Colbert	54	Mitraille	51
Condor	56	Neptune	52
Couleuvrine	56	Phlégéton	51
Courbet	47	Redoutable	47
Dague	56	Requin	46
Dévastation	47	Richelieu	53
Dragonne	56	Sainte-Barbe	56
Duguesclin	49	Salve	56
Dupuy-de-Lôme	48	Sfax	59, 60
Duquesne	57	Terrible	46
Flamme	51	Tréhouart	43
Flèche	56	Trident	54
Formidable	40, 41	Valmy	43
Furieux	50		

GERMANY.

Deutschland	61	New Ironclads A and C	65
Friedrich der Grosse	61	Preussen	61
Kaiser	61	Sachsen	63, 64
Oldenburg	62	Siegfried	66

GREECE.

Hydra	67	Spetsia	67
Psara	67		

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FOREIGN—*continued.*

ITALY.

	PLATE		PLATE
Andrea Doria	68	Italia	71, 72
Dandolo	69, 70	Lepanto	71, 72
Duilio	69, 70	Ruggiero di Lauria	68
Francesco Morosini	68	Sicilia	74
Giovanni Bausan	73		

NETHERLANDS.

Princess Wilhelmina	75

RUSSIA.

Admiral Nachimoff	76	Nicolai	81
Alexander II.	79	Pamyat Azova	82
Catherine II.	77, 78	Sinope	77, 78
Emperor Nicholas	79	Tchesmé	77, 78
Minin	80	Vladimir Monomach	83

SPAIN.

Almirante Oquendo	84	Reina Regente	86
Infanta Maria Teresa	84	Vizcaya	84
Pelayo	85		

UNITED STATES.

Atlanta	87	Maine	91
Baltimore	88	Massachusetts	93
Boston	87	Newark	92
Charlestown	89	Oregon	93
Chicago	90	Texas	94
Indiana	93	York Town	95

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ARMOUR AND ORDNANCE.

	PAGE
Annapolis competitive trials of armour (Backs of the Plates)	286
„ „ „ (Faces of the Plates)	286
British B.L. Guns (perforations)	298
„ M.L. „ „	298
Canet 15 C.M. Gun on Centre-pivoting Mounting	304
Construction of Standard types of Guns	304
Easton and Anderson's Muzzle-pivoting Mounting for the 9·2-inch Guns in H.M.S. Rupert (2 Plates)	310
Elswick High-angle Breech-loading Howitzer and Mounting	306
„ Mounting for the 9·2-inch 29-ton Guns in H.M.S. Thunderer (Plan and Section. 2 Plates)	308
„ 110¼-ton B.L. Gun	300
Fiske Range Finder	314
French Guns (perforations)	298
German „ „	298
Gruson's Shielded Mountings (Tangerhütte trials)	284
High-angle Howitzer Battery	306
Ochta competitive trials of Armour (Backs of the Plates)	288
„ „ „ (Faces of the Plates)	288
Whitworth's Mounting for the 10-inch Turret Guns for H.M.S. Devastation	308
„ Recoil Brake and Running-up Gear in H.M.S. Devastation	308

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PART I.

CHAPTER I.

THE YEAR 1890.

IT has been thought well to commence *The Naval Annual* for 1891 with a summary of the chief events in the naval history of the year, drawn mainly from our own service papers and from *Le Yacht*. Most of the subjects alluded to will be dealt with at greater length in subsequent chapters. The additions to the different Navies first demand attention.

Great Britain. Ships launched.

The number of British war-vessels (excluding torpedo boats) launched during the past year is 19, aggregating 60,860 tons, as compared with 31 vessels of 51,110 tons launched in 1889, and 17 vessels of 34,500 tons launched in 1888. Of these 19 vessels 8 were launched from the Royal dockyards, viz.: the first-class cruiser Edgar; the second-class cruiser Andromache; the third-class cruisers Pearl, Pallas, Phœbe, Philomel; and the first-class torpedo gunboats Gleaner and Gossamer. The 11 ships launched from private yards were: the first-class cruiser Blenheim; the second-class cruisers Sirius, Pique, Latona, Melampus, Naiad, Terpsichore, Thetis, Wallaroo (Australian squadron); the third-class cruiser Bellona, and the first-class torpedo gunboat Plassey (built for the Indian Government). The Blenheim, of 9000 tons displacement and 22 knots estimated speed, whose sister ship the Blake was launched in 1889 at Chatham, is the most important addition to the Navy during the year. She was launched in July from the works of the Thames Iron Company at Blackwall, and is the only ship launched which was ordered prior to the passing of the Naval Defence Act of 1889. The other cruisers of the Australian squadron are nearly all completed and ready to sail for their destination.

Ships under construction.

While no battle-ship has been launched during the year, the following are under construction:—the Barfleur, Centurion, Hood, Ramillies, Renown, Repulse, Resolution, Revenge, Royal Oak, and Royal Sovereign. In the cruiser class we have the Æolus, Apollo,

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Astræa, Bonaventure, Brilliant, Cambrian, Centaur (now named the Royal Arthur), Endymion, Gibraltar, Grafton, Hawke, Indefatigable, Intrepid, Iphigenia, Rainbow, Retribution, St. George, Sappho, Scylla, Sirius, Spartan, Theseus, and Tribune; and the torpedo gunboats Antelope, Circe, Hebe and Leda.

Having spoken of the additions to the Navy, it is with pain we have to record the loss of the Serpent with nearly all her crew on the coast of Spain.

France.

M. Weyl's observations.

M. Weyl, in his "Review of the History of the Year 1890," says: "The year which has just closed has nothing to distinguish it from the years which have gone before. On every side the increased activity in shipbuilding of late years has been maintained. . . . There is the same uncertainty as to the best means of protecting ships of war, whether it is because the experiments with projectiles charged with powerful explosives have not been sufficiently conclusive, or whether it is because the results are carefully concealed from those who have to design ships of war. However this may be, the principle which prevails with us, viz., the dispersion of the guns and the protection of each separately, has led, in the new ironclads, to each gun being sheltered in a closed turret. On the Charles Martel and Lazare Carnot this disposition has been adopted for the 14-cm. quickfirers as well as for the 30-cm. guns. On the Jauregui-berry the 14-cm. guns will be placed in pairs in closed turrets."

Ships launched.

In France, the ironclad Magenta (commenced in 1887) has been launched at Toulon; the Dupuy-de-Lôme (now fitting as flag-ship for the China station) has been launched at Brest, and the transport-sloop La Manche at Cherbourg. The Marceau, which was launched in 1887, has been completed, and underwent some satisfactory trials in October. The battle-ship Hoche has been completed for service, while the Caiman and Requin are in an advanced state. The fast cruisers Cecille, Tage, Troude, and Surcouf have been completed. The two former attained a speed of 19·2 knots on their trials under forced draught. The Jean Bart and Davout are ready for their trials, and the remaining four cruisers of the Forbin type (the Coetlogon, Cosmao, Forbin, Lalande) are now practically completed. Fourteen first-class torpedo boats were delivered in 1890, and M. Weyl tells us that during the present year, many others will be added to the Navy, the transformation of the 35 metre boats, which were found defective in design, being almost finished. It should be mentioned that a large ocean steamer, the Polynesian, fitted as an auxiliary cruiser, has been launched from the yard of the Messageries Maritimes Company at La Ciotat.

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"Both our Government and private yards," says M. Weyl, "have displayed great activity, and, thanks to some experiments with piece-work in our dockyards, results have been attained which promise well for the future. If there is a shadow in the picture, it comes less from the ships under construction than from those which are already afloat. Most of our fast cruisers have had failures in their machinery, a proof that they have not been well designed for active service at sea." Improved results in dockyards.

"The more Italy increases her Navy," says the same author, "the more she tries to be independent of foreign assistance; thus she has established in Italy the manufacture of guns, armour and torpedo boats, and no longer has recourse for these to Germany or England." Italy.

During the year, the torpedo cruiser Lombardia, and the ironclad Sardegna, built at Spezzia, have been launched. Several ships have been completed, including the Andrea Doria, which realised an average speed of 16·1 knots on her steam trials, the cruiser Partenope and the gunboat Volturno. The trial of the monster engines of the Re Umberto, which indicate 20,000 horse-power, was successful. The protected cruiser Marco Polo will soon be ready for launching, and the Fieramosca, her sister ship, has realised 18·6 knots on her trial. The Italian dockyards are thus fully employed. Considerable attention is being devoted to the improvement of coast and harbour defences, and the fortifications of La Maddalena, which commands the Strait of Bonifacio, are being actively pushed forward. The advisability of burning petroleum instead of coal in her war-ships is, according to the *United Service Gazette*, under consideration. A sea-going torpedo boat went down with all hands in a gale of wind on the passage with the squadron from Gaieta to Spezzia. This sad event attracted as much attention in Italy as the loss of the Serpent in England.

The new ship-building programme of the German Navy includes four first-class battle-ships of 10,000 tons, nine armoured coast-defence ships, and eight first-class protected cruisers, besides smaller vessels. The Siegfried is the only cruiser of the new programme that has been launched. During the year 1890 the cruiser Meteor (a modified Wacht) has been launched, and the private yards have delivered several harbour-defence and sea-going torpedo boats. The *United Service Gazette* reports that the completion of the German ship-building programme is being much delayed by the difficulty experienced in obtaining armour-plates. Germany.

"The principal ship launched in Russia during the year 1890," Russia.

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says M. Weyl, "is the battle-ship Dvenadsat Apostoloff (8076 tons). The gunboat Grozyashtchy has also been launched. Many large vessels have been put in hand, and in the spring other ships will be commenced, both in the Baltic and Black Sea. Russia is quietly pursuing the policy of strengthening her Navy, and in a few years there is no doubt that it will be worthy of the greatness of the Empire." . . . "The ironclad Sinope attained a speed of 17·85 knots on her trial trip, with 12,750 horse-power. Besides this ship, the yards at Shichau have delivered the torpedo cruiser Kazarsky, and the sea-going torpedo boats Adler and Anakria."

United States. Additions to Navy.

The vigorous effort which the United States are making to create an efficient Navy is undoubtedly the most noticeable feature in the history of ship-building during the past two years. During the year they have launched the Maine (6648 tons), the first ironclad of the new programme, the cruiser Newark (4083 tons), and the torpedo-boat Cushing, which has realised 22 knots on her trials. General Tracy, the Secretary of the Navy, in his Report, says: "During the 20 months of the present administration, 9 new ships have been put into commission, viz., the Chicago (4500 tons), York Town (1700 tons), Petrel (870 tons), Charleston (3730 tons), Baltimore (4400 tons), Philadelphia (4500 tons), San Francisco (4083 tons), Vesuvius (970 tons), Cushing (100 tons); four, including one monitor, the Mianotonomoh, have been advanced to a point where they are just about to go into commission; five are in such a condition that they will be shortly waiting only for their armour; seven have been built from the keel up, of which the Texas (6314 tons) and Monterey are nearly ready for launching, and the five cruisers are well advanced. The first five vessels on the list have been actively cruising, and all have justified, under the severe test of actual experience, the high expectations which were then formed of their efficiency as sea-going men-of-war."

During the year Congress has authorized the construction of three additional battle-ships of 10,298 tons each, a triple screw protected cruiser, a torpedo cruiser of 750 tons, and a sea-going torpedo boat. One battle-ship is to be built at the Union Iron Works at San Francisco at a cost of £636,000, the others are to be built at the works of Messrs. Cramp at Philadelphia at a cost of £605,000; these vessels are to be afloat by 1893. The United States will then possess a modern Navy of 15 armoured vessels, five of which will be of the battle-ship type, and 31 unarmoured steel vessels. These 46 ships will be of the latest type as to construction and armament.

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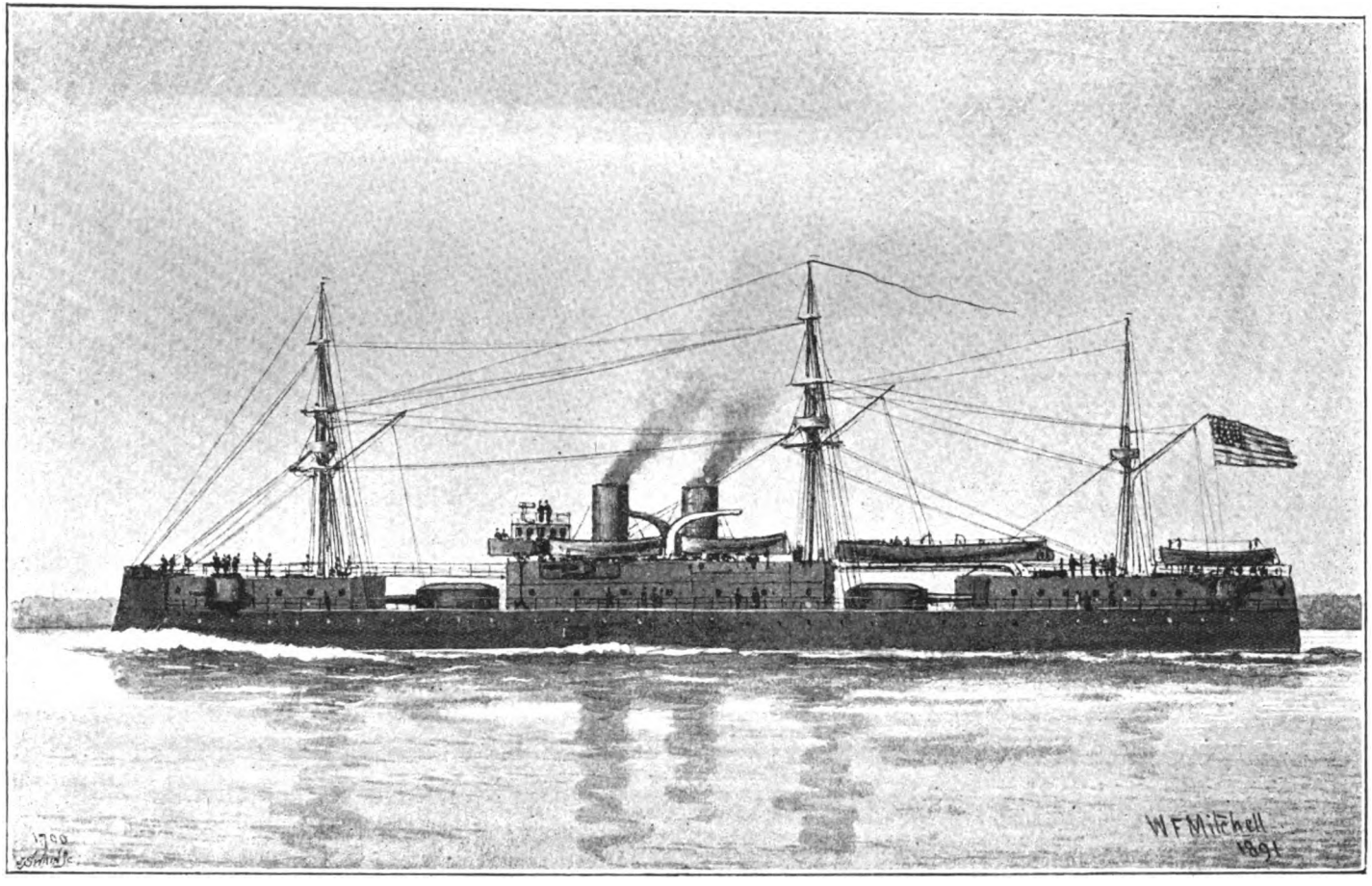

"MAINE."
AMERICAN ARMOURED CRUISER.

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The following particulars, showing the additions made to most of the less important Navies during the year, are taken mainly from M. Weyl's article in *Le Yacht*.

Austria. Austria has launched the cruiser Kaiserin Elisabeth. Another cruiser of the same type is in course of construction at Pola.

Argentine Republic. The Argentine Republic has received from the English contractors the cruisers 25 de Mayo, of 3200 tons, the torpedo gunboats Espora and Rosales, of about 600 tons, and 14 torpedo boats. The former, built by Messrs. Armstrong, attained a speed of 22·43 knots on her trial trip, while one of the 14 torpedo boats, built by Messrs. Yarrow for the same Government, with quadruple expansion engines, reached 24·453 knots on the measured mile. Those of the six first-class boats which are fitted with triple expansion engines, made one knot less.

Brazil. Brazil has launched the cruiser Almirante Tamandore (4023 tons), and the gunboat Cananca.

Chili. The ironclad, Captain Prat, and the cruisers, Presidente Pinto and Presidente Errazuriz, of 2080 tons and 19 knots speed, have been launched at La Seyne for Chili, while the torpedo gunboats, Almirante Lynch and Almirante Condell, have been completed by the English contractors.

China. China has not increased her Navy, but she fitted out two squadrons, one of which, for the first time in the history of the Chinese Navy, ventured as far as Manilla and Singapore.

Greece. Greece has closed the commission of French officers charged with the reorganisation of her Navy. The third of the new ironclads, the Psara, has been launched from the Graville Yard at Havre. The first, the Hydra, has already gone to her destination. The Psara and the Spetsia will shortly follow. The latter on her trials maintained a speed of 17·55 knots for three hours, being ·55 of a knot in excess of her contract speed. It is said that the last Cabinet intended to construct two small fast cruisers, but the Ministry of M. Delyannis has not yet disclosed its ship-building policy.

Japan. Turning to Japan, the cruiser Matsuchima has been launched at La Seyne. She is sister-ship to the Itsukusima, whose trials have been satisfactory. The Akutsima has been launched at Yokodade and the Chiyota in England. A torpedo gunboat for the Japanese Navy has also been launched at Saint Nazaire.

Mexico. Mexico is building a training-ship at Havre.

Portugal. Portugal proposes to build several ships in foreign yards, but is at present prevented by financial difficulties from carrying out her intention.

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Spain. Spain is adding several fine ships to her Navy. She has launched in 1890 the protected cruiser Infanta Maria Theresa, of 7000 tons and 20 knots speed, the third-class cruiser Marques de Ensenada, three torpedo gunboats of 600 tons, the Temerario, Anday and Nueva Espana. She has five more cruisers similar to the Infanta Maria Theresa building or in contemplation, besides the first-class cruisers—sister-ships to the Reina Regente. After the trials of the Peral, it was determined to build an even larger submarine boat.

Sweden. The Swedish vessel Gota (3100 tons) is completing by the Creusot Company.

Turkey. The additions to the Turkish Navy include a composite 15 knot cruiser Heibet-Numia, the torpedo gunboat Namet and three small torpedo-catchers. It is intended to build two fast cruisers and an ironclad. The Turkish Navy sustained a terrible disaster in the loss of the frigate Ertogrul, with nearly all hands, on the Coast of Japan.

Gunnery. "Gunnery," says M. Weyl, "continues to make progress; smokeless powder has been successfully tried." We learn from the First Lord's memorandum that the adoption of smokeless powder will necessitate the strengthening of the gun-mountings for the new ships and a consequent increase in cost. Both in England and France the preference now seems to be given to guns of moderate calibre; it has been decided to abandon the 110-ton gun for the armament of the new first-class battle-ships. The weakness shown by one of the 110-ton guns of the Sans-Pareil, has doubtless confirmed the view that the 67-ton gun is as powerful a weapon as can be required. Many would prefer an even smaller gun.

Armour. The use of nickel in conjunction with steel in the manufacture of armour is the most important feature of the year. Both at Annapolis and Ochta, the nickel-steel plates constructed at Creusot proved superior to the English, whether compound or solid steel plates. At Annapolis the Holtzer projectiles maintained the superiority now generally attributed to them.

Machinery. "The British Navy," says M. Weyl, "like our own, has had many disappointments with the trials of new ships, but the Admiralty wisely decided in many cases that it was unnecessary to enforce to the letter the terms under which the propelling machinery was to be received, and engines have therefore been accepted, which could not undergo their forced draught trials. The boilers of the Barracouta, however, were so defective that the machinery could not be accepted from the contractors." . . . "A reaction is taking place against

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the practice of giving so little weight to the machinery, a practice which has cost the two great Naval Powers of Europe very dear. With us there seems to be a determination to lay aside the unfortunate ideas which have prevailed in this question of late years."

It was stated in the *Naval Annual* of 1890, that the Admiralty had ordered that the boilers for a given power in the British Navy should be increased 20 per cent. in weight. M. Weyl's criticism, therefore, no longer applies to England with the same force. The First Lord, in the memorandum presented to Parliament with the Navy Estimates, states that there will be an excess over the estimate of £920,000, of the ships building under the Naval Defence Act. This is due to the increased weight of the boilers and machinery and to the consequent increase in size of the hulls. The country should be thankful that the Admiralty have recognised that ships which are cramped in respect of engine-room space and weight of engines, cannot maintain a continuous high rate of speed. It is well that this decision has been taken before the large number of cruisers now building are completed.

Submarine boats.

Submarine navigation has made considerable progress during the year. The Gymnote has gone through some interesting trials which appeared sufficiently conclusive to justify the laying down of the Siréne on the same lines as the Gymnote. We have lately heard that the Goubet is to go through her final trials. The intention of Spain to lay down an enlarged Peral has already been spoken of. Though submarine navigation is undoubtedly occupying more attention, it can hardly as yet be said to have passed beyond the region of experiment.

Administration and dockyards.

Economy in construction.

A new and important feature in dockyard administration is described in the following extract from the *Engineer*:—

"Attention may be directed incidentally to the fact, that, for the first time engines have been constructed at the Royal Yards, the Gossamer and Gleaner have been engined at Sheerness, the Phœbe at Devonport. Other engineering work has since been given out, and special engineering staffs have been appointed at Chatham, Portsmouth and the other yards. In his last explanatory note on the estimates, Lord George Hamilton adverted with satisfaction to the fact that the cost of building ships at the dockyards was diminishing, although it was still proportionately greater than in the case of vessels given out by contract; and he has since been able to commend the management at Sheerness for building the sloop Daphne for £67,974, against the estimate of £72,243, and saving £11,000 in the construction of the sister-ship Buzzard."

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It is mainly owing to the increased rate of construction in the dockyards that important economies over the estimates have been effected in recent ships. The First Lord states in his memorandum that the economy in the case of the Trafalgar amounts to £100,000.

During the year the Government have given contracts for heavy gun-mountings to Sir Joseph Whitworth & Co., and Messrs. Easton & Anderson. Hitherto these fittings have been supplied from Elswick.

Administrative changes. France.

In France there have been important changes in the central administration of the Navy. M. Weyl says, "The Admiralty Council has disappeared, regular inspections of the fleet have been instituted; an Ordnance Board has been established. Finally, the suppression of the Admiralty Council has entailed the creation of a committee to make a selection from the list of officers put forward for promotion. All these reforms prove that those who are responsible for the Navy do not fear to put the axe to the old edifice. We must, however, again point out the precarious position of the most important body in the Navy, the necessity for renovating it, and of doing something for the senior lieutenants. We must also insist that engineer officers should continue to be shown the esteem in which they are held by being invited to take part in the Councils of the Navy."

Manœuvres.

Naval manœuvres are now becoming an annual event in the history of every important Navy. The tax-payer undoubtedly gets good value for his money; he has the opportunity of learning, in a way which was impossible before, the naval requirements of his country, and of knowing, through the full reports which appear in the public Press, whether the ships are competent to perform the duties expected of them. The English and foreign manœuvres will be described at length in subsequent chapters. Our own manœuvres

English.

were remarkable for the fact that the opposing fleets did not come into contact. This gives rise to M. Weyl's criticisms: "It is becoming clear," he says, "that the number of problems to be worked out is restricted. The staff is so taxed to discover new problems that they invent impractical hypotheses; take for instance, the plan for manœuvres in England." The compiler does not agree altogether with M. Weyl. Many useful lessons can undoubtedly be learnt from the English Manœuvres of 1890. Before the commencement of the Grand Manœuvres operations were undertaken to test the value of the coast defences for the Needles entrance to the Solent.

French.

Bad weather was experienced during the French Naval Manœuvres, and hostile criticisms appeared in the press on the behaviour of most

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of their smaller ships. The coal supply at Brest was found to be insufficient, and there was a dearth of stokers.

German. The German Naval Manœuvres were remarkable for the fact that they were combined with those of the *corps d'armée* of Sleswig Holstein, and were under the immediate direction of the Emperor William.

Coaling stations. Progress is being slowly made with the defences of the coaling stations. Singapore has been armed under the direction of Sir Charles Warren; the earthworks and emplacements for the guns were ready nearly four years ago. The Orion, which has been acting as guard-ship, has now been sent to reinforce the Mediterranean Fleet. At Port Royal, Jamaica, some 6 in. guns are already in position, and the defences of St. Lucia are well advanced. A dock has been commenced at Bombay, which, when finished, will accommodate the largest ironclads, and arrangements are being made for the construction of a similar dock at Gibraltar. The compiler cannot too strongly express his satisfaction that these important works which he has so often recommended have, at last, been taken in hand.

Brennan torpedo. The introduction of the Brennan torpedo as a weapon for coast defence merits notice. The patent of this torpedo, after being declined by the Admiralty, was purchased by the War Office for £150,000 from the inventor. Its peculiarity consists in the fact that it can be directed from the shore by means of two wires. On the 5th of July the torpedo was successfully tried at the Needles in the presence of Mr. Stanhope, the Secretary of State for War. An old brig was towed through the Channel between Hurst Castle and Cliff End at the rate of 9 miles an hour. The torpedo passed astern of the brig, but was turned, and struck her on the port quarter, blowing her to atoms. "Opinion is generally unfavourable to the Brennan torpedo," concludes the correspondent of the *Revue du Cercle Militaire*. As a correspondent of an English Service paper remarked, 'The experiment of the 5th of July would have succeeded equally well with a heavy projectile. The brig would have been sunk, and it would not have cost £1000.'"

Vitu expedition. For the first time for some years the Navy were engaged in active operations on shore. The Vitu Expedition, which was so expeditiously and successfully terminated, was undertaken to punish the natives for the murder of nine Germans in the territory which has recently come under English protection by the Anglo-German Agreement. The rapid mobilisation of the formidable force at Zanzibar in January, 1890, on the occasion of the difficulty with Portugal was noticed in the last number of the *Naval Annual*. On

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the present occasion the Fleet concentrated at Lamu on October 24th, under the command of Rear-Admiral Fremantle, included the Boadicea, Brisk, Cossack, Turquoise, Conquest, Kingfisher, Redbreast, Pigeon and Humber. On the 27th 880 seamen and marines were landed from the Fleet. These were joined by 150 Indian troops, and 100 of the Sultan of Zanzibar's men. Porters were provided by the East African Company. On the two following days the march to Vitu was accomplished, the town was burnt, and the force returned to the ships, with a loss of only a few men wounded. The blue-jackets made a splendid effort in the 12 miles' march through thick bush, dragging their guns and carrying 50 lbs. apiece, under a tropical sun. Great credit is due to Captain the Hon. A. Curzon Howe for the effective organisation by which alone success could be insured.

Amongst other events of the year which deserve notice, we must not forget to mention the visit of the Mediterranean Squadron to Toulon, and the return visit of the French Fleet to Malta. The reception accorded to Sir Anthony Hoskins and the officers of the English Fleet was most cordial, and the French officers had a no less hearty welcome at Malta.

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CHAPTER II.

English Naval Manœuvres, 1890.

"Mobilisation," as it is explained in the Report on the Manœuvres presented to Parliament, "has no necessary connection with the grand manœuvres. Mobilisation.

"The object of the annual partial mobilisation," says the report, "is, by mobilising a portion of the reserve naval force, to test the arrangements devised for rapidly bringing up the fleet from the peace to the war footing. Partial mobilisation proceeds only to the extent of completing the crews of the coast-guard district ships and sea-going guardships at the home ports, commissioning and manning the selected ships in the first-class steam reserve, and equipping a torpedo-boat flotilla. The Royal Naval Reserve is not drawn upon, and the reserve of pensioners only to so small an extent that it is virtually untouched. The machinery for complete mobilisation is, however, set in motion; the system being so organised that only the desired amount of reserve force need be actually sent to sea. Object of.

"The order for partial mobilisation was issued on the 21st July. On the following day 24 ships of various classes, and 24 torpedo-boats, were put in commission. Nine first reserve, and 3 flagships —all being armourclads—had their crews completed. On the 26th, four days after commissioning, 33 of the above 36 ships, and all the torpedo-boats, had reached the points of assembly. By the 27th July the whole had assembled, and, with the Channel squadron, the training squadron, and a few other vessels previously in commission, formed a grand total of 56 ships of different classes and 24 torpedo-boats. The united crews comprised 18,860 officers and men, of whom 7442 belonged to the ships specially commissioned, and 1499 were absorbed in completing the complements of the first reserve ships. Mobilisation carried out.

"The aggregate number of engine-room ratings of the whole fleet when assembled was 3827, and there were no deficiencies; indeed, a certain number of stokers, second-class, were distributed as supernumeraries amongst the ships to gain sea experience during the manœuvres."

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Forces engaged in manœuvres.

The forces for the 1890 manœuvres were constituted as follows:—

"BRITISH."		"THE ENEMY."
Main, or A Fleet.	Reserve, or B Squadron.	C Fleet.
VICE-ADMIRAL SIR GEORGE TRYON, K.C.B., in Command. REAR-ADMIRAL R. E. TRACEY, Second in Command.	COMMODORE POWLETT.	VICE-ADMIRAL SIR MICHAEL CULME-SEYMOUR, Bart., in Command. REAR-ADMIRAL F. C. B. ROBINSON, Second in Command.
Battle-Ships:	*Battle-Ships and Coast Defence Ships:*	*Battle-Ships:*
Northumberland.	Belleisle.	Camperdown.
Anson.	Hecate.	Minotaur.
Rodney.	Glatton.	Howe.
Inflexible.	Cyclops.	Conqueror.
Invincible.	Hydra.	Iron Duke.
Triumph.	Gorgon.	Audacious.
Hotspur.	Hecla.	Neptune.
Black Prince.		Ajax.
Hero.		
		Cruisers and smaller craft:
Cruisers and smaller craft:	*Cruisers and smaller craft:*	Immortalité.
Narcissus.	Active.	Aurora.
Galatea.	Rattlesnake.	Northampton.
Shannon.	Grasshopper.	Forth.
Iris.		Medea.
Thames.	*Torpedo-Boats:*	Arethusa.
Mersey.	No. 65.	Tartar.
Medusa.	„ 67.	Barrosa.
Inconstant.	„ 68.	Serpent.
Mohawk.	„ 72.	Sandfly.
Racoon.	„ 73.	Curlew.
Basilisk.	„ 74.	Traveller.
Speedwell.	„ 78.	
Spider.	„ 79.	*Torpedo-Boats:*
	„ 80.	No. 45.
	„ 83.	„ 51.
	„ 84.	„ 52.
	„ 85.	„ 54.
		„ 55.
		„ 57.
		„ 58.
		„ 59.
		„ 81.
		„ 82.
		„ 86.
		„ 87.
And the following Cruisers for special service:		
Calypso.*		
Ruby.*		

* The Calypso and Ruby did not take part in the general manœuvres, but were employed in connection with the coast signal stations and the system of distributing intelligence.

Gunnery practice and steam tactics.

Before the actual manœuvres began the fleet was exercised for two days at gunnery practice and steam tactics.

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The *Army and Navy Gazette* says: "It would be difficult to overestimate the value of the alteration in the programme of the autumn naval manœuvres, which once more includes gun practice and fleet evolutions as part of the teaching of the annual cruise. *Army and Navy Gazette* on value of.

"In the short space of four years, the coast-guardsmen have fallen from their high esteem as marksmen, simply because the annual cruise has been devoted to simulated operations only, and no time could be found for firing at a target. There is great rejoicing because so few mistakes have been made at steam tactics, whereas four years ago the captains of the reserve ships would have scorned the idea of making any mistakes at all in an exercise in which at least once a year they all participated. Indeed, target practice and fleet evolutions combined was the *raison d'être* of the annual cruise, until people went crazy about the mimic wars. The fit is now passed and common sense prevails; so while one part of the six weeks' mobilisation is devoted to tactics and guns, the other is very properly and wisely given up to strategy and experience gained under conditions as nearly as possible approximating to those of warfare. It will be a great pity if a year is ever allowed to pass again without a fair allotment of time to each item."

A leading article in the *Broad Arrow* contains the following observations on the same subject:—

"All readers of the accounts of Admiral Tryon's 'two days' gun practice, may be struck by the two prominent features of it—the engagement of the targets in the old line-of-battle, and the advantage of the leeward position. How does it arise that these two elements came at once into being? The answer is, simply the necessities of the case. The moment Sir George Tryon had before him the problem of carrying out systematic gun-practice in the least possible time, he found it was only to be done in line-of-battle and to leeward. He at once gives the whole service a hint which ought to withdraw it from those vague and fancy ideas of a naval action, and bring its thoughts back to the practical and the common sense—those two governors of success in war. If Admiral Tryon was forced by circumstances into line-ahead, and the leeward position, even by a line of targets, does it not remain quite certain that if within a week it became his duty to take a body of ships into action with a line of the enemy, he would start with a strong belief—which would be shared by all his captains—in the line-ahead and the leeward position?" *Broad Arrow.*

During the practice two of the Inflexible's guns could not be worked owing to the breakdown of the hydraulic gear. One of the Guns disabled.

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Hero's guns was also disabled. "These disasters," says the *Army and Navy Gazette*, "will enormously strengthen the hands of the party of reform, who demand that every gun shall be capable of being man-handled."

Manœuvres, Aug. 8th–18th.

The manœuvres of 1890 lasted from August 8th to 18th. The principal object of the 1890 manœuvres is thus defined in the Report presented to Parliament:

Principal object.

"To ascertain under what conditions a hostile fleet could maintain itself on an important trade route and interrupt the traffic, always endeavouring to avoid a general engagement; also under what conditions a slightly superior British Fleet could successfully manœuvre to bring the hostile force to action and compel it to return to port."

The subsidiary objects were:

Subsidiary objects.

"To obtain information as to the most advantageous methods of employing a considerable body of scouting cruisers on both sides.

"To ascertain the measures which a reserve fleet, chiefly composed of coast-defence vessels, whilst operating from a strategic point in the English Channel, should take to contribute to the support of the main fleet and to protect itself against torpedo-boat attack.

"To ascertain what form the tactics of torpedo-boats operating from a distant base should assume."

Explanations and conditions.

"In the scheme of operations or 'general idea,' it was explained that cruisers would be allowed to put to sea, before 'hostilities' actually occurred, to watch the movements of the opposite side. Immediately on the 'declaration of war' the main 'hostile' fleet was to put to sea and take up the most suitable position on the trade route, entering the English Channel from the westward. Twenty-four hours after the 'enemy's' departure the 'British' Fleet would proceed to look for him, in order to engage or compel him to return to port. It was stated that as long as the 'hostile' fleet maintained its position on the trade route, simulated attacks on commerce—which during former manœuvres had been made, according to certain rules, by cruisers individually or in groups—would be unnecessary. The employment of cruisers would, therefore, be devoted to scouting, which was one of the 'objects' specially mentioned, and despatch services. On 'hostilities' becoming imminent the Reserve Fleet would move to Portland, secure itself there against torpedo-boat attack, and at the same time keep in readiness to put to sea at short notice. A division of 'hostile' torpedo-boats, with an escorting cruiser, would assemble at Alderney, which place was to be a base of operations against the Reserve Fleet, or any ships of the 'British' Fleet that might navigate the English Channel. The 'hostile' fleet

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might use Berehaven and the Shannon as its base-ports. The 'British' Fleet might resort to any port in the United Kingdom not lying between Carnsore Point and Cape Clear, or between Cape Clear and Achill Head."

Sir G. Tryon's Memorandum.

Before operations commenced, Sir George Tryon clearly saw that, if Sir Michael Seymour did what he actually did do, the two fleets would not come into contact and he would be unable to drive him from the trade route. The only chance of meeting was in case the B Fleet should try to slip past the British Fleet either into the English or Irish Channel. On August 5th Sir George Tryon issued the following memorandum :—

"H.M.S. Northumberland, at sea.
"August 5th, 1890.

"GENERAL MEMORANDUM.

"A little consideration of the printed paper of rules, entitled 'The 1890 Manœuvres' will show that if our opponent elects to steer, in the first instance, for a position within the trade route approximately 140 miles to the south-westward of Scilly, that is, equidistant from Berehaven and Plymouth, then to steer a course with Plymouth right astern, he will continue on the trade route and distance Plymouth every mile he goes, and not distance Berehaven to a corresponding extent, and therefore, as he has twenty-four hours' start, even if I go at once to that spot, the speed and coal endurance of the two fleets being approximately equal, by no possibility can he be overtaken by us.

"For him to do so would be strictly within the rules as I read them, but it would hardly be a sporting course to adopt from a peace manœuvre point of view, though it would be very damaging to trade and commerce.

"It is open to me to assume that he will do so, but that at some time or other he will return to Berehaven to coal, and I might take up a position off that port, having first searched the Shannon, a defended port, but open to torpedo-boat attack, but I have no torpedo-boats with which to disturb him there. But should he hear through a cruiser, as he easily might, and probably would, that I had adopted such a course, it would be open to him simply to rest on the trade route, and save coal during the whole time of the manœuvres, and to return at leisure subsequently to Torbay.

"I therefore reject both of the above propositions, the first because it cannot be met, the second because it would leave everything to

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his force. It remains to see what he will do to help us, and I rely on our cruisers and a vigilant look-out to avail ourselves of any opportunities that may be presented.

(Signed) "G. TRYON, Vice-Admiral.

"The Rear-Admiral and Officers commanding
"H.M. ships A Fleet."

Position of forces at opening of hostilities.

"At the moment of beginning hostilities the position of the respective forces was, stated generally, as follows:—

"The A Fleet, three of its cruisers having been despatched to Pembroke, was lying in Plymouth Sound. The B Squadron was at Portland, where it had taken measures to protect itself against torpedo-boats. A detachment of the C Fleet, consisting of the Curlew, Traveller, Sandfly, and three of the 'enemy's' torpedo-boats, was at Alderney, where special defences had been extemporised. On the previous afternoon Commander Barry had sent his three fastest torpedo-boats to Guernsey, and they were followed in the evening by six others, which were ordered to cruise or anchor as desirable off the south-west corner of the island. The rest of the C Fleet was at Berehaven.

Scouting operations.

"'Scouting operations commenced,' as permitted by the rules, on August 7th, by the despatch of the Rattlesnake from C Squadron, to reconnoitre Alderney and the adjacent islands. Commander Barry thinking she approached too near the harbour fired at her, and claimed to have sunk her. This claim was disallowed by the umpires, Admiral Sir William Dowell, Vice-Admiral Sir Frederick Richards, Rear-Admiral Fitzroy. At 11 P.M., on the 7th August, Sir George Tryon despatched three cruisers to Pembroke, and during the first watch of the 8th sent out a powerful squadron of fast cruisers to a position on the western side of the trade route, where it was 'to watch and guard.'"

C Fleet leaves Berehaven.

At 5 P.M., on August 8th, the hour for the commencement of hostilities, Sir Michael Seymour steamed out of Berehaven unobserved.

The following extracts from the letter of the correspondent of the *United Service Gazette*, give the history of the subsequent proceedings of C Fleet:—

Subsequent proceedings.

"The fleet sailed from Bantry Bay on the evening of the 8th inst. The Neptune was left behind, as much owing to her change of command through the promotion of Captain Grant and her having to wait for her new captain as from the fact of her being an expensive ship in the consumption of fuel. The Ruby had been sent away previous to the departure of the main fleet on the special mission of

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touring round our coastguard stations, and keeping them on the *qui-vive* until our return, should she be able to evade capture by Admiral Tryon's cruisers. To make up for these deficiencies in our numbers, Admiral Seymour took with him three steam colliers all filled up to their utmost capacity of 800 tons each, which were kept in line astern of us by the Barrosa as we worked out of the bay. These colliers, having soon dropped astern, were sent off under escort of the little cruiser to sail astride the trade route to the northward of the Azores, so as to avoid being picked up by our enemy, and meet us at the rendezvous already alluded to. The rest of the fleet pressed on its way out into the Atlantic in two columns at eight knots speed day and night; the masted ships, like the Minotaur, Iron Duke, and Northampton, having all their canvas set to help them on their way, while the Serpent and Tartar rigged up fore and aft sails.

"At noon on Saturday we were 156 miles from Bantry Bay, with a good breeze on our starboard quarter, which fortunately kept with us the greater part of our subsequent journey.

Coal consumption.

"On the afternoon of the 11th a special signal was made from the Camperdown to 'indicate coal consumption per hour at present speed.' This speed was eight knots, and, as the consumption of fuel has been from start to finish the most interesting feature of the cruise so far, the various rates of the different ships may be as well noted here. The Camperdown, which had, by the way, taken the Serpent in tow to save her coals, averaged 2 tons 8 cwt. per hour; the Howe, towing the Tartar, was more extravagant, mounting up to 3 tons 15 cwt.; the Conqueror was very modest, poor, ill-looking, 'half boot,' 'bath slipper,' as she is frequently styled, only consuming 1 ton 6 cwt. per hour; the Audacious gave her estimate at 2 tons 2 cwt. The Aurora and Medea, first and second-class cruisers, both gave the same rate of consumption, strange to say, for 8 knots speed, only 16 cwt. each per hour. The Minotaur, belonging to the second column, was fairish, considering her old engines, which have only single cylinders, and have not the triple expansion power of modern ironclads, her rate of burning fuel being 2 tons 7 cwt. per hour. The Iron Duke nearly equalled her sister ship, the Audacious, burning each hour 2 tons 3 cwt.; the Ajax indicated hers at 2 tons 6 cwt.; the Northampton, the worst of all for her size and speed, gave 2 tons 17 cwt.; and, lastly, the Forth, cruiser, was just 1 ton 1 cwt."

Rendezvous with colliers.

On the night of the 14th, C Fleet reached the first rendezvous midway between Madeira and the Azores, and 1400 miles from Cape Clear, but there were no signs of the colliers. The Admiral

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sent off the Aurora and Forth to scout for them with orders to bring them on to a rendezvous 300 miles further south. To this the fleet proceeded at the reduced speed of 6 knots. On the night of the 17th an electric light was observed ahead, which soon proved to be the cruisers in company with the colliers. The next morning a general signal was made for each ship to give an account of the fuel they had in hand; from this it appeared that the new battleships and cruisers had ample coal to enable them to return to England. The older battleships had not. Admiral Seymour therefore divided his fleet into two squadrons, and leaving the Minotaur, Ajax, Northampton, Iron Duke, Audacious and Barrosa behind to coal, sailed off with the Anson, Howe, Immortalité (towing the Serpent), and the Aurora (towing the Tartar). The other cruisers were bound for a rendezvous 80 miles south of St. Michael's.

Coaling at sea.

Though the sea was calm the correspondent of the *United Service Gazette* says:—"Some of the commanding officers thought coaling at sea hazardous in the extreme, both to their own ships and the colliers; but Captain Boyle of the Ajax denied the danger, saying that the work could be quite as well performed as in an open roadstead, provided the sea was calm. His opinion was justified to the letter, and being quite content to make the first experiment Captain Boyle soon had a collier lashed alongside with coals hoisting in at a speedy rate."

The quantity of coal taken in by the different ships was as follows:—

Minotaur	250 tons in	14½	hours.
Iron Duke	150 „	7¾	„
Audacious	318 „	26½	„
Ajax	310 „	18½	„
Northampton	170 „	10¾	„
Barrosa *	28 „	4	„

* The Barrosa coaled by means of her boats.

Importance of.

"The conditions may have been, as they appeared to some," says the Admiralty report, "so exceptionally favourable that their recurrence is likely to be rare. Still the coaling of a fleet of modern battleships, even in the lower latitudes of the North Atlantic, is an unprecented performance; and the fact that it has been actually carried out points to the conclusion that it is a possibility of naval warfare which will have to be reckoned with."

Homeward voyage.

The voyage home was made at good speed but in worse conditions as to weather than the voyage out. The following concludes the account of the correspondont of the *United Service Gazette*:—

"The Camperdown, flag-ship of Vice-Admiral Culme-Seymour,

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and all the other vessels comprising the hostile fleet, arrived in Torbay on Thursday morning at the end of their long cruise. Although the fleet has been three weeks at sea and has traversed a distance of about 3,500 miles, there has not been a single mishap, save the loss of the poor fellow from the Iron Duke. Nor has there been the slightest breakdown in the squadron, all of the ships of new and ancient type having stood the prolonged strain on their machinery, even when going continually at ten-knot speed, without the slightest hitch, although the short interval when they were coaling in mid-ocean was the only time allowed for the engineers to have a chance of cleaning up below.

"All day on Monday last, while the fleet were steaming homewards, a speed of nine knots was maintained; and a heavy following sea drove the ships on with such force as to ease the engines considerably. During Tuesday afternoon the wind freshened considerably, and towards evening, after the ships had entered the Bay of Biscay, it blew nearly a gale, with the waves reaching as high as 25 or 30 feet. On board the Minotaur the continual rolling played havoc with the crockery-ware below, the Conqueror was observed to roll even to a greater extent than the Minotaur, while the Camperdown (flag-ship) took in whole seas forward, washing her upper deck."

Operations in Home waters.

The operations of the fleets in Home waters now demand attention. The night of August 8th was the occasion of a spirited attack by the enemy's torpedo-boats on the ships in Plymouth Sound. The following account appeared in *Engineering* on September 26th.

Torpedo-boats' attack on A fleet.

"The headquarters of the hostile torpedo flotilla was at Alderney, under the directions of Commander Barry, of the Curlew. It was determined to attack the British fleet at Plymouth as soon as possible after receiving an intimation that hostilities had commenced. Fearing, however, that Alderney might be invested by the enemy's cruisers and the attack frustrated, the flotilla moved to Guernsey on the 7th. One division of the fastest boats, under Lieutenant Wells, in No. 87, went to Peter Port, and the remainder, under Lieutenant Sturdee, lay in a bay at the south-east end of the island. Information that war had been declared reached Lieutenant Wells shortly before 6 P.M. on the 8th, and he at once proceeded to sea with his division of boats, and passing Lieutenant Sturdee's force, acquainted that officer that hostilities had commenced. The second division started shortly afterwards. The great object was to get to Plymouth before daylight, and therefore it was considered desirable that the two divisions should proceed independently, so that the fast boats should at any rate arrive in good time, and not be kept back by the

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slower contingent. The Start Light was made by the first division before midnight, and as Plymouth was approached the boats were closed up and speed increased to over 19 knots. Shortly after 2 A.M. the boats rounded the east end of the breakwater, and at that moment appear to have been observed by the *Black Prince*, which was lying at that end of the line. The firing of a rifle, blank cartridge, from this ship gave the alarm, and it was followed by three musket shots from the *Invincible*. But the boats were now all among the ships discharging their torpedoes, and though guns and search lights were quickly brought into play, and some of the boats would probably have been sunk in actual warfare, two or three ships would no doubt have been disabled. In the meantime Lieutenant Sturdee with four boats was approaching the western end of the breakwater, and his doing so undetected was facilitated by the noise and smoke of the first attack. Just as the officers of the squadron thought all was over for the night, and were preparing to seek again the repose so rudely disturbed, the second attack took place. Guns and search lights were again brought into action, and it will be a difficult question to decide whether boats or ships suffered most. As in all such cases, both sides claim the victory, and where projectiles are left out of the guns the award may be very different to what the actual result would be in war. No one can say how effective the fire will be from ships under such circumstances when peace conditions are absent. But of this we may be sure, that to hit a torpedo boat advancing towards a ship in grim earnest at 20 knots, on a dark night, will tax skill and nerve in the highest degree. Among the many incidents which occurred on this occasion may be noted the accident to No. 82. This boat having discharged her bow torpedo at the *Black Prince*, desired to turn immediately and beat a retreat. But at this most critical moment her steering apparatus broke down, and she was carried stem on against the vessel and sustained considerable damage. In war she must have been captured or sunk. This liability is inherent to the end-on attack, and even when no such accident occurs, the boat remains in danger for a considerable period, owing to the fact that she must continue to approach the ship considerably after discharging her torpedo before she can turn away. Another source of danger was the regulation which put a boat out of action for twenty-four hours after projecting a torpedo, and compelled her to remain on the spot to pick up her missile. She thus becomes a rock, as it were, to other boats following up, with every chance of being run into, besides being a source of confusion to the ships. On several occasions, boats in this condition have monopolised the fire

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of innumerable guns for many minutes, while new adversaries were passing elsewhere unnoticed. Instead of this, all boats after delivering their fire should remain some distance off until the action is over, and then return to pick up their torpedoes. Being limited to one discharge, and the twenty-four hours' rule, are also unnecessarily severe conditions."

No decision given in attack.

The reports sent to the Admiralty were so conflicting that the umpires found themselves utterly unable to come to any decision. As an example the *Black Prince*, claimed as torpedoed, said that no torpedo had struck her. Considering that the ships had not their torpedo-nets down, the judgment of the correspondent of *Engineering* is probably correct. Though some of the torpedo-boats might have been sunk, two or three ships would doubtless have been disabled.

Remaining operations of torpedo-boats.

Before describing the steps Sir George Tryon took to protect the trade route it will be better to notice the remaining operations of the torpedo flotilla during the manœuvres. An attack was made on C Fleet at Portland on the night of the 8th, but the attack was not pushed home. Several attacks were made on vessels in Falmouth. On the 12th torpedo-boats 86 and 87 claimed to have captured five colliers as well as the *Speedwell* and *Hearty*. The latter claimed the capture of the torpedo-boats, but both claims were disallowed. On the 13th Nos. 55 and 57 carried out an exceedingly bold attack on the *Narcissus* in the Hamoaze, and No. 87 claimed to have captured some colliers at Falmouth. These claims, as well as those of the 14th by Nos. 59 and 81, and of the 15th by No. 81, were disallowed. On the other hand No. 51 of the C Fleet was captured by Nos. 79 and 68; No. 58 was captured by the *Active* after an unsuccessful attack; No. 54 was put out of action for forty-eight hours for an unsuccessful attack on the Hydra. The only claim of C Fleet which was allowed was the capture of the *Rattlesnake* by No. 54 as she was coaling in Plymouth Sound.

Operations of A fleet.

We now come to the operations of A Fleet. The Vice-Admiral left Plymouth at 5 P.M. on the 9th with the main Fleet, pushing Rear-Admiral Tracey on in advance with the Anson, Rodney, and Hearty to support the cruisers. The next day he was rejoined by Admiral Tracey and five of the cruisers at a prearranged rendezvous off Scilly; three powerful cruisers being engaged on reconnoitring duty 100 miles to the S.W.

Change of base.

Sir George Tryon's next care was to effect a change of his base to Scilly. He first directed nine of his supply colliers to proceed to Falmouth, so that the enemy's torpedo flotilla might suppose

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that he was going to use Falmouth as his coaling station, as he did last year. He then shifted as many colliers as he needed to supply his wants to Scilly, placed the *Hotspur* as guardship over the anchorage, while special defences were arranged for St. Mary's Sound. "The result of this change of base was important. 'Falmouth,' as the Admiral of A Fleet reported, 'seems to have received much attention from the torpedo-boats stationed at Alderney.'" Only one torpedo-boat got as far as the Scilly Islands.

"Sir George Tryon," says the report, "after shifting his base sent out a squadron of cruisers under Captain Moore and others singly to patrol the trade route where it was narrowest and most exposed to depredation. Whilst this service was being performed he kept the main fleet off the Scilly signal station, with which he was able to keep up communication."

A fleet proceeds to look for enemy.

"Sir George Tryon," says the correspondent of the *United Service Gazette*, "did not like to explore the trade route until he was quite satisfied that none of Sir Michael Culme-Seymour's ships were behind his fleet; and he was not satisfied on this point until Thursday morning, the 14th inst., more than five days and a half after the declaration of war, and, consequently, when the war was more than half over. At 8 A.M. on this day the fleet proceeded to the southward and westward, scattered on the trade route in the following order:—Starboard side of *Northumberland—Triumph, Black Prince,* and *Shannon;* and on her port side, *Invincible, Inflexible, Hero, Anson,* and *Rodney.* These ships were stationed at three-mile intervals diagonally across the trade route on a S.S.E. and N.N.W. line, so that the *Rodney, Anson,* and *Hero* would probably be the first battle-ships to get touch of the enemy, and the slow *Shannon* the last. The *Hearty* was stationed near the flag-ship as a despatch vessel, and the *Mersey, Thames, Medusa,* and *Racoon* were ordered to patrol the easternmost portion of the trade route, from 3 miles off the *Rodney,* dividing the space between them, and as it widened increasing their speed and zigzagging." There being nine ships in the line, the area covered was 27 miles, but the cruisers on the east flank gave a further range of vision to 50 miles, or sufficient to cover the narrowest portion of the trade route. "The *Inconstant* was not with us; the *Hotspur* was left behind at St. Mary's, Scilly, as being too extravagant a coal consumer, with the *Speedwell, Spider,* and the *Hero's* steam picket boat as scouts, and the *Mohawk* was left behind to coal."

On arriving in latitude 46° 30′ without seeing any sign of the enemy the fleet turned homewards. The above-quoted correspondent continues:—

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Homeward voyage.

"After turning up the trade route the heavy swell struck our port quarter instead of our starboard bow, and it afterwards came nearly abeam; consequently, in the middle watch on Saturday morning the *Anson* rolled 21° to starboard and 20° to port, and in the morning watch the maximum roll was attained—this was 24° to starboard and 22° to port. The *Rodney's* greatest roll was 31° one way, and the Hero's 35°, in performing which gambol the sea washed a cutter from her davits. Before leaving the Scillies the *Narcissus* reported a breakdown which prevented her going more than 12 knots an hour, and which would require thirty hours at Plymouth to make good, so she was ordered to rejoin off the Scillies in forty-eight hours, and when we started down south, Sir George left orders for her. Consequently on Saturday afternoon the *Narcissus*, *Iris*, and *Galatea* rejoined, and the fleet stopped at 4.10 P.M. to enable Admiral Tryon to communicate with the cruisers, which were then detached on secret service off Ushant and to the Irish ports."

Breakdowns.

The squadron, after communicating with the Scillies, proceeded to a rendezvous off the Shambles and finally reached port. Two breakdowns occurred beside that already mentioned. The *Black Prince* broke the rod of one of her air-pumps and had to be taken in tow of the *Hearty*. The *Thames* had one boiler disabled and could not steam more than 9 knots. The *Triumph* under steam and sail found herself unable to keep pace with the fleet at 9 knots.

Umpires' decision.

The umpires found that the hostile fleet had attained its principal object in the manœuvres, and had succeeded in remaining undisturbed on the trade route; that the first of the secondary objects, viz., the best method of employing a body of scouting cruisers had been shown by the operations of A Fleet; that B (or the Reserve) Fleet had no opportunity of supporting the main fleet; that the torpedo operations during the early part of the manœuvres were well planned and efficiently carried out, but were afterwards not so successful, owing to the many deviations from the rules laid down for the conduct of the war.

Criticisms on the plan of the manœuvres.

The plan of the manœuvres of 1890, as it has been mentioned in the previous chapter, has been severely criticised by many writers both at home and abroad. The correspondent of the *United Service Gazette* says:—

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"The manœuvres have proved the least satisfactory of any that we have yet had, as the two fleets saw nothing of one another during the war. Sir George Tryon considers that he had an impossible task to perform, so contented himself with seeing that the enemy did not take him in the rear, and get up Channel. To have made the

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game a fair one, either the two fleets should have left their ports simultaneously, or a southern limit, say in latitude 40° N., should have been fixed to the trade route, so that on reaching this limit the enemy would have had to dodge back, and endeavour to get behind the English Fleet."

The real cause of Sir G. Tryon's failure to bring the hostile fleet to action was undoubtedly the want of fast cruisers. The same correspondent quoted above, says:—

Want of cruisers.

"Had Sir George Tryon possessed a sufficient number of cruisers with greater speed than the Camperdown and Howe, Sir Michael Culme-Seymour's two fastest battle-ships, he would probably have sent them outside the Irish ports to watch the enemy and keep touch with all his ships, whether they remained as a fleet or divided into groups or single ships, sending a report every twelve hours of his movements. To perform this service thoroughly would have required about twenty fast cruisers.

Army and Navy Gazette.

The correspondent of the *Army and Navy Gazette* also considers a more rigorous attempt might have been made to keep touch of the enemy on his leaving Bantry Bay, though he holds the Admiralty to blame for creating an impossible problem for Sir G. Tryon to solve.

Sir G. Tryon not altogether unsuccessful.

While Admiral Seymour held his fleet so close that he only sighted three trading vessels, on the other hand Sir G. Tryon by no means failed altogether in protecting the most important part of the trade route. "The disposition of A Fleet," we quote from the pages of the report presented to Parliament, "was such that, whilst it covered the space that had to be searched, the ships could have been been assembled and got into fighting formation before an enemy, sighted by the scouts, could have approached within engaging distance.

Criticism of report on his dispositions.

"It is a well-established principle of war that a long line of communication cannot be efficiently protected throughout its whole extent. To try to do so would be to leave it insufficiently protected everywhere. A selection of the point or points which can be properly defended has to be made. The part that should be selected is that at which, if left without adequate protection, the enemy would have it in his power to do most damage. In the case of a trade route, this is the so-called 'neck of commerce,' or part where the traffic is concentrated and offers the best opportunity to a depredator. It is on this principle that effectual protection of maritime trade has been based in real war. The task before the A Fleet was to keep the 'enemy' from attacking the trade where he could do it most mischief. This task was greatly complicated by the good fortune of the C Fleet in having got well away to sea unobserved. The disposition of

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the A Fleet was such that the 'Enemy's' Fleet could not have attempted to operate against the most valuable and most vulnerable section of the route without considerable risk of being caught and defeated by a superior force. At the same time, Sir George Tryon's movements were so arranged that he was in almost constant communication with England, ready to receive any intelligence that it might be desired to transmit to him. In addition to this, the general position of the A Fleet was favourable for covering the Channel, and was so chosen that had the 'enemy' tried to make a dash at the latter, his attempt would in all probability have been frustrated."

Lessons to be drawn from the manœuvres.

Want of fast cruisers.

Sir Geoffrey Hornby's letter to the *Times*.

The lack of fast cruisers, to which we have just alluded, is undoubtedly the chief lesson to be drawn from the manœvures. We have large numbers of fast cruisers building or completing, but no one can say that they will be sufficiently powerful or sufficiently numerous to protect our ocean trade. Sir Geoffrey Hornby enforces this point in a letter to the *Times* of December 22nd. "Admiral Seymour was confined to the area between the West Indian and South American routes, and it was hopeless for Sir George Tryon to catch him with the few cruisers that he had. How much more hopeless then, if, like a foreign admiral, he had been free to rove from the Mediterranean route to the North American route!" In a paper read before the London Chamber of Commerce Sir Geoffrey Hornby stated we should require as many cruisers to protect our trade now as were necessary in 1814—489. "And cruisers," he says in his letter to the *Times*, "do not necessarily imply fighting-ships. Fast ships are essential, and ships commanded by men with heads. It was not the Euryalus that was so valuable to Nelson, but her captain—Fremantle. If they are unarmed they will have one advantage; they will not be tempted to fight.

"Cruisers are our vedettes. We want them to collect and to bring us information; and this brings me to my second reason. It is useless to have ships unless we know how to handle them. I believe no one knows now how best to handle ships as scouts or vedettes; for this excellent reason—that it has hardly been tried.

"Such manœuvres as were ordered this year by the Admiralty give the opportunity for such trials. The only question that remains is whether every possible opportunity was used this year to test that urgent need; and I think we must say it was not.

"In 1885 one of the 'greyhounds of the sea,' the Oregon, was enlisted to assist in the summer manœuvres; and when the competitive part of them began the division to which the Oregon was

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opposed held that there was only one ship in the world that troubled them, and that was the Oregon. If she appeared they were hopeless, for they could not shake her off.

"If Sir George Tryon had been given three such greyhounds his search would have been a very different thing."

This last observation opens up the very serious question of the discrepancy between the sea speed and actual speed under forced draught of our fastest cruisers. For instance in the *Engineer* a table is given showing the various speed of the cruisers engaged in the manœuvres.

	Estimated.	Actual with forced Draught.	Speed at Sea.
	Knots.	Knots.	Knots.
1st Class Cruisers (Galatea) . . .	18·5	16·8	14·4
2nd „ „ (Thames) . . .	18·0	16·0	13·2
„ „ „ (Medusa) . . .	20·0	18·1	15·8

When ships have been some time in commission and the engine-room complements have become accustomed to their machinery, the discrepancy between the sea speed and that realised on the measured mile is much reduced. The speeds given above were certainly in many cases exceeded before the end of the manœuvres.

Coaling at sea.

From the cruise of the C Fleet we have acquired many valuable data as to the speed and coal endurance of the ships of which it was composed. We have also learnt the important lesson, already alluded to, that coaling at sea in a future naval war is a possibility which will have to be reckoned with. With improved appliances the operation can be made quicker and more certain.

Torpedo attack.

The most important lesson from the manœuvres is to be drawn from the operations of the torpedo-boats at Alderney so skilfully directed by Commander Barry, and so energetically carried out by the officers under him. Though most of the captures claimed by them were disallowed, and though in the opinion of the umpires they did not play the game in the latter part of the war, there can be no doubt, as M. Weyl says, of the dash and endurance of the officers. They worked hard, and it would have been a serious matter for many English ships if the torpedos they fired had been actually loaded. The report presented to Parliament has some interesting observations on this point:—

"The radius of action of a torpedo-boat is limited less by her coal

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and feed-water supply than by the physical endurance of her crew, especially of her commander. It has been assumed that the physical strain caused by continuous attention to the navigation of a boat at night cannot be supported for more than a very few hours, if the officers undergoing it are to arrive on the scene of operations still so unwearied that neither nerve, nor coolness, nor readiness of resource would be likely to fail them at the critical moment. During the late manœuvres it was proved by actual experience that there are officers who can navigate their boats for hours together across a crowded route, can reach their objective punctually at the prearranged time, and can then manœuvre at very high speed at night in an anchorage so filled with shipping that manœuvring in it when fresh and in broad daylight would require much care and attention. Lieutenant Wells, commanding No. 87, upon one occasion made a continuous run of 420 miles, during which he examined 53 vessels. A result of the 1890 manœuvres is, that opinions on the effective radius of torpedo-boat action will have to be reconsidered."

The following from *Engineering* is also worth quoting :—

Value for training purposes of torpedo-boat operations.

"We come now to the principal lesson from a naval point of view learned from these torpedo-boat operations, and that is the great value for training purposes such service has to young officers whose future will be entirely cast in steam vessels. Whether it can replace that early training in the manipulation of masts and sails, which only many believe can give the skill, nerve, and resource, which have hitherto characterised our seamen, I am not prepared now to argue, but it would appear in every way desirable that a certain period in a torpedo-boat should be an essential part of a naval education. To carry this into effect a proportion of the boats should always be in commission at the different ports, the remainder being kept in reserve, and to replace periodically those which required refit or repair. A captain or commander should be appointed especially in charge of the whole flotilla, who would be responsible that the boats were kept in order, that their equipment was complete, and proper discipline maintained. At present, there is too often a tendency to regard temporary service in a torpedo-boat as absolving the crew from strict adherence to naval regulations. With every desire to recognise the discomfort on board these boats in nearly all weathers, there is no reason why in calm intervals there should not be some approach in appearance to ordinary vessels of war. This would be secured by adopting such measures as I have briefly alluded to. In conclusion, if this portion of the naval manœuvres has no other effect than that of drawing attention to the necessity of organising our

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local defences so as to counteract what is likely to occur instead of preparing for fleets which must be met elsewhere, the hostile torpedo-boats must be considered to have rendered good service."

The compiler entirely agrees that training in a torpedo-boat is invaluable for young officers.

M. Weyl's conclusions.

M. Weyl, in his able article in *Le Yacht*, on the English Manœuvres, after showing that reconnoitring to a great distance by means of frigates and small craft, was the constant practice of the last century, says that successful scouting for a naval force depends on a number of circumstances, and, above all, on the weather. "If this last is true it is necessary in naval manœuvres to limit the unforeseen with which sailors have always got to reckon, and the means of doing so are generally easy to find. Take for example the English manœuvres which have just finished. It may be presumed that the Admiralty wished the two fleets to meet, otherwise why was Admiral Tryon left free to cruise on his own coast and his opponent to sail into the middle of the Atlantic Ocean? If Admiral Seymour had had sealed instructions to be opened on successive dates, ordering him to return towards the entrance to the Channel, and to place himself near the point of convergence of the trade route to Great Britain, he would not, it is true, have been responsible for the consequences of his movements, but his adversary would have had a better opportunity of showing his ability as a naval strategist and commander. The chance of meeting would have been increased, and the public would have been able to form an idea of the result of the manœuvres; whereas it is difficult at present to draw any practical lesson for our guidance in the future.

Plan of manœuvres.

"We must conclude that simple problems are the best for naval manœuvres. Hitherto the solution of the problems proposed is often very different from that which had been anticipated."

Mobilisation.

Though M. Weyl did not think much was to be learned from the actual manœuvres, he compares the mobilisation of the English Fleet very favourably with that of the French. "To combine in the same fleet ships which have been some time in commission, and with which both their commanders and the Admiral of the Fleet feel confidence, and ships fitted out in a hurry with scratch crews and officers who do not know them, and to send them to sea to study tactics, appears to me nonsense. In England the mobilisation was not carried out as a surprise or by means of the telegraph. Everything was ready beforehand; everyone knew his place, and was there at the appointed time. It was admitted in fact that a great war will be preceded by negotiations, and that the fleet will be arming while the diplomats

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are still talking. Thus, though there has been no brilliant event in the British manœuvres of this year, the mobilisation was a success, and we may be sure that profitable lessons will be learnt from it."

Torpedo-boat operations.

"The English clearly see," M. Weyl continues, "what damage a cloud of torpedo-boats might do to a fleet cruising in narrow waters. . . . The English manœuvres have shown once again that torpedo-boats well handled are formidable weapons at a small distance from the shore, and two countries like France and England, which are only separated by a narrow strait, will both of them have to reckon very carefully with these engines of war."

Hospitals.

At the conclusion of the manœuvres operations were carried out with a view of testing the facilities for the landing and conveyance of wounded to the naval hospitals at Portsmouth, Devonport and Chatham. The number assumed to be wounded was 1449. The means of conveyance were found to be sufficient, but temporary hospital accommodation would in some cases have had to be provided, and at all the ports an increase of the hospital *personnel* would have been necessary.

The Needles operations.

In the early days of July operations were carried out at the Needles to test the value of the defences of the Isle of Wight. The following account is taken from the *United Service Gazette*:—

Trials of the Isle of Wight defences.

"In order to test the value of the military precautions taken to protect the Solent, the Western Defence Section of Portsmouth and the Isle of Wight was mobilised from the 30th ult. till the 10th inst., during which period the various works and forts included in that district have been fully manned, and there has been night and day practice with torpedoes, mines, and cannon at imaginary invading flotillas and fleets. The troops called up, and constituting the defending force, under Colonel J. F. Owen, R.A., Commandant of the sub-section, consisted of the 23rd and 27th batteries Southern Division and the 8th and 25th batteries Western Division Royal Artillery; 22nd (Submarine Miners) and 32nd companies Royal Engineers; 4th battalion Rifle Brigade; detachments of the Army Service and Ordnance Store Corps; the Hants Artillery, Isle of Wight Artillery, and the Wicklow Artillery Militia; 3rd battalion East Surrey Regiment; detachment of the Portsmouth Division Submarine Miners; and the 1st and 2nd Hants Artillery Volunteers. This force, which represents an aggregate of 3,600 officers and men, and forms an instalment of 28,000 men who are understood to be available for the defence of the approaches to Portsmouth, was distributed among the forts guarding the entrance of the Needles passage as follows:—

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1st division, 750 strong, under Col. Boyle, Rifle Brigade, at Golden Hill and Freshwater redoubts, for the defence of the line of the Yar; 2nd division, 200 (Captain Wingfield-Stratford, R.E.), Fort Victoria and Mine Fields; 3rd division, 1,350 (Colonel Watson, Isle of Wight Artillery), Cliff End and Warden batteries and adjacent coast; 4th division, about 600 (Colonel Twiss, 2nd Hants), Hatherwood and Needles batteries and the neighbouring coast-line; 5th division, 600 (Lieut-Colonel Walkley, R.A.), Hurst Castle. As the accommodation within the forts was wholly inadequate for the reception of the troops, the bulk of them on arrival went into camp near the several stations, and, as may be supposed, suffered considerably from the recent high winds and heavy rains.

"The primary objects of the mobilisation and the projected operations were clear and defined, though of a strictly limited nature. It was officially announced that when the Navy co-operated with the military it was to be distinctly understood that the attacks were in no way to be regarded as sham fights, but merely as an experimental means of testing the organisation for the defence of the sub-section, the tactical working of the forts, the electric light arrangements, &c. The vessels employed would not, it was stated, be of the class which would be expected to undertake an attack, but would simply represent the possible movements and actions of battle-ships, &c., and were on that account to be considered as a 'skeleton force.'

"Following on General the Hon. Sir Leicester Smyth's inspection of the various batteries, the naval flotilla, consisting of the Hecla, Captain Gallwey, who was Commodore, accompanied by the armed tug Magnet and four torpedo-boats, each commanded by a lieutenant and provided simply with electric search lights, flash lights, and rockets, were engaged on Friday and Saturday night in rehearsing the tactics about to be pursued. The vigilance of those in the batteries ashore was constantly tested, but neither fort nor battery was caught napping, the electric search lights of the garrison being instantly turned on any approaching craft.

"Two of the small craft returned to Portsmouth in a disabled condition, one having injured her propellor by running upon a shoal, and the other having sustained injuries to her machinery while keeping up steam to prevent drifting. On Sunday there was a church parade and religious service at Golden Hill.

"The grand night attack by a representative naval force was carried out on Tuesday night in a strong south-westerly breeze. The defending troops were in position in good time. The eastern front was supposed to be protected by the river Yar. Between the

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village of Freshwater and the Freshwater redoubt a long line of outposts was placed, supported by an artillery battalion, armed with machine-guns, which, in case of the enemy effecting a landing, could fall back upon another strong position situate between Ballard's Hill and Hawk's Ridge, effectually covered by the batteries of Golden Hill Fort. By nine o'clock everything was in readiness, so far as defences were concerned; but the invading flotilla, which, though consisting merely of the Hecla, Rattlesnake, Pincher, and Mastiff, with two torpedo-boats, was supposed to represent an adequate iron-clad fleet, still lay out in the Channel, dodging as best it could the concentrated glare of the full-power search lights which streamed out all along the threatened coast from the Needles to the Yar. Ever and anon the outline of an invading craft was discovered by the penetrating electric beams. It was nearly ten o'clock before the information was telephoned from station to station along the cliffs that the enemy's flotilla could be seen approaching the Needles, and the big guns ashore and afloat were soon busily at work, though at irregular intervals, there being no disposition on either side to waste valuable ammunition. The optical effects on the sky and cloud and sea, ever and anon lit up by the brilliant beams of the electric light crossing each other, and the broad flashes from the guns at each discharge, made as pretty a sight as was ever witnessed, either afloat or ashore.

"The Commander-in-Chief afterwards proceeded to Warden Point to observe the development of the sea attack, which was, according to the programme arranged, to be made by four line-of-battle ships, represented by the Hecla and three gunboats, accompanied by the Rattlesnake and two first-class and two second-class torpedo-boats. The engagement opened with an interchange of shots between the gun-boats and the Needles battery, and soon afterwards the Rattlesnake was dimly detected through the thick mist making her way round the Needles. She was accompanied by a couple of torpedo-boats, but these were invisible to the gunners ashore. Warden Point battery boomed out with its 38-ton guns, and Hurst Castle quickly followed suit; but the torpedo-catcher still came on at full speed, regardless of the warm reception, until passing the Coastguard Station above Totland Bay she opened on the gunners within the ramparts at Warden Point. The Rattlesnake now managed to wrap herself up in a cloud of dense smoke, which hid her effectually from the batteries as she steamed hard for the channel between Hurst Castle and Cliff End, where the torpedoists on the shore were waiting to launch a dummy Brennan. An attack by torpedo-boats attached

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to the defence on the advancing fleet had meantime been repulsed by aid of musketry and machine guns. The Brennan torpedo was launched by the Royal Engineers at the Rattlesnake, whose torpedo-boats made a daring attempt to cut the wires by which the submarine weapon is controlled; but such a hot cross-fire was poured upon the torpedo-boats from Cliff End and Hurst Castle that they were promptly ruled out of action. It was evident, however, that no torpedo could be launched at the Rattlesnake running at her extreme speed with any certainty of hitting her amid the cloud of smoke which hung around her. In the result the swift little craft got through unhurt, the other vessels immediately following suit. Thus an entry into the Solent was effected, but the attacking fleet was exposed all along to a tremendous fire from the forts and batteries, and no patriotic islander will believe it could have withstood so severe a cannonading. The flotilla was now in the mine fields, and its dangers were not at an end when the signal was given to cease operations."

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CHAPTER III.

Foreign Naval Manœuvres, 1890.

I.

France.

The French naval manœuvres were not as heretofore conducted separately by the Mediterranean Squadron and the squadron of the North. The Mediterranean Squadron concentrated at Oran on the 22nd of June, and, after some preliminary operations in the Straits between the Balearic Isles, passed the Straits of Gibraltar, arriving at Brest on July 2nd without accident. The ships were then organised in two squadrons, consisting of two sub-divisions each, as follows:—

Ships engaged in manœuvres.

First squadron, under the command of Vice-Admiral Duperré.

First Division.	Second Division.
Formidable.	Marengo (flag-ship).
Amiral Duperré.	Requin.
Courbet.	Furieux.
Sfax.	Primauguet.
Forbin.	Epervier (torpedo-sloop).
Dragonne (torpedo-sloop).	2 torpedo-boats.
3 torpedo-boats.	

Second squadron, under the command of Rear-Admiral Alquier.

Third Division.	Fourth Division.
Trident.	Vauban.
Amiral Baudin.	Duguesclin.
Redoutable.	Bayard.
Forfait.	Rigault de Genouilly.
Vautour.	Milan.
Dague (torpedo-sloop).	Couleuvrine (torpedo-sloop).
3 torpedo-boats.	2 torpedo-boats.

Each sub-division, as will be seen, consisted of three ironclads, a first-class cruiser, a torpedo cruiser, a torpedo gunboat of the Bombe

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type, besides torpedo-boats. Each ironclad had thus a cruiser and a torpedo-catcher attached to it, as French Admirals have from time to time been demanding.

Mediterranean squadron moved.

"The object of removing the Mediterranean Squadron from its station," says the *Revue du Cercle Militaire*, "was not only to familiarise the officers and crews with the practice of navigation in conditions of weather and tide to which they were not accustomed; it was also intended to test the seaworthiness of the ships of which it was composed. It was well known that many of the ships built at Toulon had not yet cruised in open waters."

Finally the manœuvres were intended to fix definitely certain principles of naval tactics and to arrange long distance signals.

The naval manœuvres were divided into two periods:

First Period.

"Scouting" objects of first period.

In the first period the object was to discover the best system for distant scouting; to determine the use that could be made of cruisers and torpedo-gunboats as the eyes of the fleet, in order to discover the position of the enemy and the state of his preparations; to establish a rapid method for transmitting intelligence from the most advanced scouts; finally to test by actual practice the modifications which the addition of a fourth division of ironclads would necessitate in the evolution of a squadron.

The fleet left Brest on the 6th July. On the first day the Admiral executed several evolutions in order to get his squadrons in hand. They anchored that night at Morgat in the Bay of Douarnenez.

System tested.

On the 7th July, a system of scouting was tested. The four light divisions, consisting of cruisers, torpedo-catchers, &c., were grouped in the form of a lozenge round the battle-ships, the gunboats at 1200 metres, the torpedo-catchers at 2400 metres, and the cruisers at 4500 metres from the fleet.

Formation adopted.

The divisions at the head and at the rear of the fleet were in line ahead, those on the flanks in line abreast, pivoting on the centre of the fleet. The Admiral then gave the order to the light ships to extend their range of observation to double the distance. In this formation the torpedo-catchers were at 4800 metres, the cruisers at nearly nine kilometres from the fleet. The squadron thus found itself protected in every direction to about 23 or 24 kilometres.

Behaviour of Ironclads at sea.

The weather came on bad in the afternoon, and the Admiral sent the smaller vessels in charge of the Forbin into the anchorage of Glenans. The ironclads remained at sea all night, and though in

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the execution of the various orders they had to take the sea at all angles, they behaved admirably.

In the afternoon of the 9th, the whole fleet anchored at Quiberon. During the night there was an attack by the torpedo-boats. Owing to the mist the electric light was of more use to the attacking boats than to the defenders, and several succeeded in discharging their torpedoes within the regulation distance. Torpedo-boat attacks.

On the 10th July the fleet left Quiberon and carried out some evolutions, ending with an attack by torpedo-boats. The two squadrons each in line ahead, at 600 metres interval, defiled past one another on parallel lines but in opposite directions. The gunboats were on the flank further from the enemy. The torpedo-boats of the first squadron, divided into two groups, were posted astern of the Formidable and Amiral Duperré, ready to attack the leading ironclads of the second squadron: the first group attacking the Admiral Baudin, after passing ahead of the Formidable; the second group, on passing astern of the Formidable and Amiral Duperré, was to attack the Trident.

The attack was boldly carried out; the torpedo-boats only remained three minutes under the fire of the ironclads. A second attack was not so successful.

After carrying out various evolutions, the fleet put in again to Brest on the 13th, and on the 15th filled up with coal.

Second Period.

In the second period of the manœuvres two problems were proposed for solution:—

1st. A squadron leaving Cherbourg was to endeavour to effect a junction at the entrance of the Channel with a squadron coming from Toulon, which did not know that war had been declared. Problems of second period.

2nd. A hostile squadron from the North Sea was to attack the coasts of Normandy. The French Fleet, the bulk of which was at Saint Waast La Hougue, was to protect Cherbourg and Havre. A division of the French Fleet was posted at the entrance of the Straits of Dover above Dieppe, with cruisers detached in order to keep the Admiral informed of the enemy's movements. On hearing of the arrival of the enemy, the main fleet was to support the advanced division as quickly as possible, and, with their united forces, endeavour to drive the hostile fleet back into the North Sea.

The fleet left Brest on the 17th July in the same order as on the 6th. The Milan ran ashore on the Fillettes bank, and had to return

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to Brest to make good damages. It became so foggy in the afternoon that the fleet had to anchor in the Bay of Douarnenez, where it remained for the next two days.

Torpedo-boat attack.

On the evening of the 19th, the fog having cleared off, preparations were made for a torpedo-boat attack, the torpedo-gunboats Dague, Dragonne, Bombe, and Couleuvrine being posted as the lookouts of the fleets. At 9.35, the Dague and the Bombe discovered the first group of torpedo-boats and at once opened fire. In spite of this, both the first and a second group of torpedo-boats succeeded in passing the lookout ships; but, as they immediately afterwards came under the rays of the electric light, they were exposed to a murderous fire.

In summing up the attack, the *Revue du Cercle Militaire* remarks: "Can it be said that the attack completely failed? We do not think so. Before forming an opinion on the subject, we must know the actual effect of the weapons employed, and we must above all take into account the fact that the alarm of a torpedo-boat attack does not conduce to steadiness of aim."

Manœuvres proper. First Part.

The manœuvres proper commenced on the 20th July. The force assembled was divided into two fleets. The first under Vice-Admiral Duperré, leaving its torpedo-boats behind, steered to the northward. It was supposed to have left Cherbourg at 4 A.M. on the 21st July. The other, under Rear-Admiral Alquier, steered to the southward, and had to manœuvre to reach Cherbourg without communicating with Ushant, just as if it had come from Toulon.

It was a case of putting into practice on a large scale the system of scouting, which had been tried in the first period of the manœuvres.

Meeting of the fleets.

During the night of the 20th and 21st, Admiral Alquier's Fleet steered back to the north-west, passed in sight of the Ile Vierge, and shaped a course for Cape La Hogue. At midday on the 21st, opposite the Ile de Bas, the weather being foggy, the cruisers of the Southern Fleet signalled that the Channel Fleet was in sight. The combined fleets then steered for Saint Waast, where they arrived on the evening of the 22nd.

Second Part.

The enemy was represented by the cruisers Primauguet and Rigault de Genouilly. The French lookout division consisting of the ironclads Marengo, Requin, and Furieux, the cruisers Sfax, Forfait, Vautour, and the torpedo-boats 128 and Edmond Fontaine, under Rear-Admiral Gervais, got under weigh at 11 P.M. on the 22nd.

The bulk of the fleet remained at anchor on the 23rd, covering at

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the same time Cherbourg and Havre. The torpedo-boats were distributed as scouts, so as to form a large circle, at two and a-half miles distance from the fleet. During the night the Milan was entrusted with the care of this line. The fleet was in fighting order.

At 6 A.M. on the 24th, the Vautour brought the news that Admiral Gervais' division had got touch of the enemy. The fleet at once got under way, and left the roadstead in line-ahead. The speed was soon increased from 8 to 10·5 knots, with the cruisers on either flank of the column. The Forbin was sent on ahead to chase the suspicious vessels without losing sight of the Admiral.

The Admiral then gave the order to form line-abreast on the Admiral Baudin, the ironclads at 1000 metres interval. When the division of Admiral Gervais rejoined, it was formed as a reserve in rear of the fleet, and the Courbet and Redoutable were ordered to chase.

At 10 o'clock the fleet rallied and steered for Saint Waast; on the 25th it entered Cherbourg. The manœuvres were brought to a close with the bombardment of the Port of Cherbourg, followed by the forcing of the entrances, and by a torpedo-boat attack on the fleet.

Lessons of the manœuvres.

The *Revue du Cercle Militaire*, from which the above account has been taken, has some interesting observations on the lessons to be drawn from the manœuvres.

Sea-worthiness.

One of the objects of the manœuvres was to test the seaworthiness of the ships of the Mediterranean Squadron. The ironclads and the cruisers behaved admirably in the rough waters of the Atlantic Ocean; but the torpedo-gunboats were a subject of continuous anxiety to the Admiral in command. Both the Dague and Couleuvrine were in constant difficulties with their machinery, on their way from Gibraltar to Brest. The *Revue* concludes that these vessels, however useful they may be against torpedo-boats and as lookout ships, cannot be depended on for service in the open sea. "In the Mediterranean, where the weather is more often fine and where ports of refuge are handy, they may be used; but in the Atlantic Ocean they should be confined to coast service, and to scouting from a fixed base as auxiliaries of the cruisers.

Torpedo-gunboats.

"But in order to get the most out of these vessels, such as they are, they must have better boilers. And if the original type is to be preserved, the engines must be improved and 'too many horses must not be put in the same stable,' according to the picturesque expression of an English Admiral." M. Weyl speaks highly of No. 128, constructed by Messrs. Normand.

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Scouting. The system of scouting in the form of a cross which was tested during the manœuvres is, he thinks, only satisfactory for a limited range of observation. When that range is extended to 45 or 50 kilometres, the gaps between the arms of the cross must be filled by other vessels. The body of the fleet will then be completely surrounded by a girdle of lookout ships. Even this is not sufficient. Cruisers must from time to time leave the circle to determine whether the enemy is or is not within a certain specified zone. If it is desired to ascertain his exact position, a very numerous body of scouts will be necessary.

M. Weyl says: "The most interesting point of the manœuvres is that they demonstrate the fact that all our tactics must be remodelled; the present rules of naval warfare do not provide for the handling of a large fleet, nor for reconnoitring at a great distance by means of a cloud of cruisers."

Strategy. The *Revue* draws the following lessons in strategy from the manœuvres:—

"1. The principal commercial ports, as well as our naval ports, should be provided with sufficient fuel to re-coal the fleet several times over.

"The coal depôts at Brest only contained sufficient fuel for one coaling of the squadron during the manœuvres.

"2. More use ought to be made of the signal stations on the coast for the rapid transmission of news.

"3. The average speed of ironclads, viz. 8 knots, is too slow to admit of their remaining in the neighbourhood of the enemy's torpedo-boats during the night. Ports of refuge are therefore necessary within distance of the coasts which they wish to attack."

(This does not appear either necessary or always attainable.)

Tactics. From a tactical point of view, the *Revue* has the following observations:—

"1. The evolutions executed in the first period of the manœuvres appear to have established precise rules of tactics to be followed in the future.

"2. The evolutions, however, were executed very slowly, especially in changing from line ahead to line abreast.

"3. The French manœuvres show the necessity for more fast cruisers to carry out an efficient system of scouting.

"4. Higher speeds should be employed more frequently, but not without due notice, otherwise there must be breakdowns.

"5. The manœuvres in the Atlantic Ocean are an admirable training for officers and crews."

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The difficult navigation amongst the shoals of the Brittany coast give the commanding officers both nerve and quickness. The compiler would gladly add his tribute of praise at the skill with which Admiral Duperré handled his fleet in these dangerous waters.

Failures in machinery

"Pessimists are fond of enlarging on the accidents which have happened to our own men-of-war, but the following record," says the *United Service Gazette*, "will show that we have no monopoly of misfortunes of that kind. The fleet engaged in the recent French naval manœuvres left Toulon on June 15, and had only been out a few hours when the Forbin dropped out of line, signalling that the piston-rod of her starboard engine was carried away. She had to go into harbour to replace it, and her services were lost to the squadron for several days. On the 17th the feed-pumps of the Dague broke down, and she had to be taken in tow by the Milan. The 22nd was a desperate day; first the Vauban had to fall out with hot bearings, then the Courbet carried away her steering-gear, and was nearly twenty-four hours replacing it, and then the Trident found she could not keep up with the fleet, though they were only steaming 8½ knots in a flat calm and smooth sea. On the 26th the Couleuvrine's boiler-tubes started leaking, and she had to be taken in tow by the Redoutable, while the same office was performed for her sister ship the Dague, whose feed-pump had again given out, by the Courbet. On the 27th, the Vautour broke down, and was unable to resume her station for more than twelve hours, and the next day the Trident did the same. The fleet was compelled to remain at Brest from June 29 till July 2, making good defects, and they had barely got outside when the Dague broke down in the same way as before. On the 17th, when going out of Brest, the Milan struck on a rock and knocked a hole in her bottom 7 feet long by 3 feet in depth, and her pumps hardly kept her afloat till she could reach the docks. She was temporarily repaired in a most creditable manner by the dockyard, and rejoined the fleet in a little under three days, but there is no doubt that in war time she would have been practically a lost ship. On the 20th the Epervier's circulating engine broke down, and she was obliged to go into dock at Cherbourg, where her injuries were found to be so serious that she is not expected to be out of the dockyard hands before September. It must be remembered that most of the accidents occurred to vessels which were not merely put into commission for the occasion with crews unaccustomed to the type of ship and engines, but formed part of the regular Mediterranean and Channel Squadrons, so that their damages may be regarded as incidental to any well-found French fleet of the present day."

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Break-down of torpedo-gunboats.

On the return journey to Toulon all the four torpedo-gunboats, besides the Sfax and Milan, broke down, and had to be taken in tow. M. Weyl says: "This campaign has clearly shown what the endurance of our torpedo-gunboats is worth, and the speed was rarely more than 8 knots, a humiliating speed enough for vessels said to be fast. The boilers of the gunboats are to be changed, but this time let us be careful not to adopt too light machinery." M. Weyl would like to see the torpedo-gunboats never out of commission, and a flying squadron of fast cruisers constituted as soon as those of the Forbin type are finished. He concludes his article on the manœuvres with a word of well-merited praise to the officers and men engaged, for the spirit with which they entered into their work.

II.

German Manœuvres.

The German naval manœuvres took place in September. The ships engaged were divided into three squadrons—A, under Vice-Admiral Deinhardt, consisted of the ironclads Baden, Baiern, Wurtemburg, Oldenburg, and the gunboat Zieten; B, under Rear-Admiral Schröder, consisting of the ironclads Kaiser, Friedrich der Grosser, the corvette Irene, and the gunboat Pfeil; C, consisting of 18 sea-going torpedo-boats, and the gunboat Blitz.

Problem.

The first few days of the manœuvres were occupied with operations on shore. The problem to be solved by the fleet was, according to M. Weyl, as follows: "A hostile fleet has passed the Great Belt. The German fleet, which is anchored in the Flansburg fiord, gets under weigh at once, seeks the enemy and destroys his fleet. The hostile fleet was represented by six hulks, which had been moored at night at a place not made known to the German officers. The problem thus consisted in finding the hulks, which ought not to be very difficult."

Emperor in command.

The Emperor, hoisting his flag on board the Baden, took charge of the operations in person. The Empress witnessed the manœuvres from the yacht Hohenzollern. On the receipt of the expected news, the Irene, commanded by Prince Henry of Prussia, the torpedo-gunboats Pfeil and Zieten, and all the torpedo-boats were ordered to get under weigh and seek the enemy. The ironclads followed at first in line-ahead, but on leaving the port they formed in columns of division.

A few miles south of the Island of Alben the hulks were discovered

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moored in a single line two cables' length from one another. The Emperor then gave the order to re-form in line-ahead, and passing along the enemy's fleet at less than three cables' lengths, directed upon it a terrible fire; and doubling on the last ship of the line the same was repeated from the other side. None of the hulks were sunk; they were riddled with shot, but the effect of the fire of the machine-guns was much greater than of that of the heavier pieces. To complete their destruction, the Emperor gave the order for the first division and the Irene to ram the unfortunate vessels, and they were promptly sunk. The crowning act over, the fleet returned to port.

Attack on hulks.

The *Times* and M. Weyl agree that no lesson can be drawn from these operations, which the former says appear to have been designed to produce a striking representation of a real naval battle. The changes of formation were executed with precision, and distance was accurately preserved, but the gunnery practice cannot have been of a very high order, or the hulks would have been sunk. Moreover, the German captains did not diminish their speed before ramming, which would probably have resulted in serious damage to their own ships if their victims had been of a more substantial character.

Criticisms of the *Times*.

During the remainder of the manœuvres the fleet merely acted in concert with the land forces, protecting the passage of Alsen, and landing parties to co-operate in the attacks. The Emperor directed the operations of the fleet from the shore by means of a signal mast placed near the Duppel monument.

Italian Manœuvres.

The Italian naval manœuvres took place at the beginning of July on the Ligurian coast. The object was simply to test the value of the coast defences and the means of transmitting information by signal stations. All the thirty-three stations along that part of the coast which had been selected as the scene of operations were mobilised and provided with electric light for signalling at night.

Object of manœuvres.

The fleet was divided. The first squadron which was charged with the defences was under the command of the Duke of Genoa, the Queen's brother, and consisted of the battle-ship Lepanto (14,860 tons), the protected torpedo-rams, Piemonte (2480 tons), and Dogali (2200 tons), the torpedo-cruisers Mozambano, Montebello, and Goito, and eight sea-going torpedo-boats. The head-quarters were at Porto Ferrajo in the island of Elba.

Forces engaged.

The second squadron under the command of Rear-Admiral Berton de Sambuy consisted of the battle-ships Dandolo and Duilio (11,880

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tons), Ruggiero di Lauria (11,000 tons), the torpedo-vessels Avolboio, Aquila, Falco, and Nibio, of 160 tons and with a speed of 26 knots, and four sea-going torpedo-boats of the Schichau type. It will thus be seen that, with the exception of the Dandolo and Duilio, the ships engaged were all of modern type and constituted a most formidable force.

Great satisfaction was expressed by the Italians at the immunity from accidents in the engine-room, such as have been frequent in the more prolonged operations undertaken by the fleets of other powers.

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CHAPTER IV.

Board of Admiralty.

Present board of Admiralty.

In sending forth the fifth volume of *The Naval Annual*, it is an agreeable duty to the compiler once more to pay a tribute of praise to Lord George Hamilton and his colleagues of the present Board of Admiralty. They have administered the affairs of the Navy in a manner to deserve the grateful recognition of the country. They have been fortunate in being in office at a time when public opinion is more alive to naval requirements than in bygone years, when the benches of the House of Commons were almost deserted on the nights devoted to the Navy Estimates.

Mr. Forwood.

The naval members of the Board will be unanimous in acknowledging the great advantage they derive from the co-operation of Mr. Forwood. The presence at the Admiralty of a man of long and varied practical experience in trade and commerce strengthens the administration on its weakest side. On the essentials of fighting efficiency naval men do not stand in need of advice from the outside. Their experiences are of less value in suggesting the cheapest way of establishing and maintaining the fleet at a proper standard of strength. In the unceasing conflict with the niggardliness and red-tape of the Treasury on the one hand, and the tendency to extravagance on the other, Mr. Forwood may be relied upon to strike a just balance. He holds the national purse-strings with a firm and steady grip.

Distribution of business at Admiralty.

In the Session of 1890 a command paper was issued to Parliament, showing the distribution of business at the Board of Admiralty in 1885 and at the present time. The changes are unimportant. While the Navy is in theory administered by a Board, appointed by patent, to execute the office of High Admiral, in practice the First Lord has an undivided authority and supreme control. Looking to the distribution of business as between the several members of the Board, it is clear that an undue burden is thrown upon the First Sea Lord. The explanation is to be found in the love of power which in vigorous natures is rarely absent. First Sea Lords have the remedy

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in their own hands. To hand over duties would be to part with power. Hence the reluctance to lighten the load. To place the Royal Marines under the supervision of the Second Sea Lord is a step in the right direction, which the compiler takes the opportunity to recommend.

First Sea Lord.

The Royal Commission on the naval and military departments express the opinion that the superior responsibility of the First Sea Lord, as the chief of the staff, and the confidential adviser of the First Lord, should be marked by assigning to him a higher position at the Board than that held by his colleagues. Such a step is of doubtful expediency. No change in the existing arrangements would strengthen the commanding influence which the First Sea Lord already holds. On the other hand, officers whose advice it would be desirable to secure, might not be disposed to take a seat at the Board in a position of marked inferiority.

Controller of Navy. Appointment of assistant recommended.

The Controller of the Navy is not less seriously overloaded with duties in relation to the *matériel* of the fleet than is the First Sea Lord in relation to the *personnel* and the general duties of the supreme command. It would be a wise act of liberality on the part of the Treasury to sanction the appointment of at least one naval officer of the rank of captain as an assistant to the Controller. Frequent visits to the ports by the Assistant Controller would secure that in the fitting-out and completing stages of construction the work was carried out under effective naval supervision. Many costly changes and modifications would by this means be avoided. The appointment of a deputy would enable the Controller to leave his post at Whitehall more frequently than at present, and thus to keep more perfectly in touch with the service afloat. It would be of the greatest advantage if the Controller could hoist his flag every year during the naval manœuvres. A short experience at sea would enable him to return to Whitehall with a practical knowledge of the qualities and defects of the ships of the latest types.

Administration abroad.

It may be interesting to glance at the system of administration adopted in other countries.

France.

In France a superior Council of the Navy has recently been created, over whose deliberations the Minister of Marine presides, and by whom he is advised. The change will assimilate the naval administration of France to that established at Whitehall. In France, in addition to the Council, three inspectors-general have been appointed, charged respectively with the inspection of ships in the reserve and fitting out, mobilisation, manning and training, and coast defence. The French naval press has urged the appointment

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of a new ordnance department, with exclusive responsibility for the armaments of the Navy.

Germany. In Germany the Admiralty is organised on a footing similar to that of the War Office. It is divided into two branches: (1) the Commander-in-Chief; (2) the Secretary of State. The branches are located in separate buildings. The Secretary of State is charged with the construction of the fleet and with the provision of supplies. The Commander-in-Chief distributes the supplies to the ships and directs their movements. The Emperor, as Commander-in-Chief of the fleet, is assisted by a naval council of advice.

Italy. In Italy the administration is in the hands of a Minister, with whom is associated an assistant Secretary of State. The Minister is supported by a council of naval officers and Controller of Naval Construction. All the members of the Board undertake duties of inspection. The shipbuilding is supervised and directed by a Council of Construction composed of civilians and three captains.

Russia. In Russia the Emperor is the naval Commander-in-Chief. His functions are exercised by a Grand Duke, who is president of a Council, the Minister of Marine acting as Vice-President. The Council is responsible for the framing of the estimates and the duties of inspection. The manning of the Navy is under the direction of a strong general staff of naval officers.

Austria. In Austria the Navy is a branch of the Ministry of War. The chief of the Navy is responsible to the Emperor directly on naval matters. In questions of finance he is subordinate to the Minister of War. A technical Committee of Advice sits at Pola. It includes constructors and naval officers, and is divided into the departments of shipbuilding, machinery, armaments, torpedo-service, electricity, and hydrography.

Intelligence branch. At the British Admiralty the Intelligence Branch is the latest addition to the organisation. Under Captain Hall and Captain Bridge it has become of the greatest value both as a repository of information, and for the responsible and difficult task of preparing plans for the effective utilisation of the naval resources of the country under all conceivable conditions and contingencies. Sir Geoffrey Hornby has urged that the new department should be strengthened. He reminds us that the German staff employs a hundred officers, and has for its head the most able general in the service. Our Intelligence Branch consists of eleven officers. Sir Geoffrey Hornby suggests that Her Majesty's Government should prepare for the unforeseen by establishing a naval staff, selected, recruited, and worked on the German model. Such a step would in his judgment

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conduce more to the strength of the Navy than even the reinforcement of ships which is now being made.

Transfer of ordnance stores.

Speech of Mr. Forwood.

The transfer to the Navy of the supply of its own ordnance stores is the most important administrative change of the year 1890. The steps which have been taken were described and criticised by Mr. Forwood in a speech delivered at Seaforth on the 19th January last. "At the present moment," he said, "they were carrying out an immense change in their service, one desired by naval men for years and years—he meant the custody, charge, and accounts of the ordnance and ammunition for the fleet. At present the War Office was in entire charge of this branch of the naval service. It might appear strange that whilst the Admiralty designed, built, equipped sailed, and manned the ships, yet over the armament of the vessel they had only an indirect control. He was not quite accurate in this statement, for they had something to do with a small portion of the warlike equipment, such as torpedoes and the carriages for the guns; but this division of charge, slight as it was, only made confusion worse confounded. The Admiralty did not know whether there was a proper and sufficient supply of ammunition or reserve guns for their ships, because the accounts were not kept by them. They had, however, a strong suspicion that there was a shortage, serious at one time, but now fast decreasing. This state of affairs, which he had briefly and faintly tried to depict, had been present to the minds of successive Governments, and since 1837 had been under the consideration of many committees. Changes had from time to time been made. The last alteration, made two years ago, gave the Admiralty the task of asking Parliament for the money, but leaving its expenditure still in the hands of another department. It was a question in which half measures were worse than none. This was realized by the First Lord of the Admiralty, by Mr. Stanhope, and by the Chancellor of the Exchequer. In May last, consequently, a committee was formed, consisting of Mr. Brodrick, M.P., Mr. Waterhouse, the well-known accountant, Mr. Mills, the Deputy Auditor-General, Mr. Knox, Accountant-General of the War Office, and Sir Gerald Fitzgerald, of the Admiralty. That committee did him the honour to place him in the chair. They took much evidence, which confirmed all he had stated. The great gun wharves and ordnance stores of the country were personally inspected, and the conclusions at which they arrived in their report were considered by the Prime Minister and members of the Cabinet whose departments were directly interested. In the result their recommendations were adopted. They embraced an absolute transfer of all naval ordnance

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and stores from the War Office to the custody of the Admiralty, and a division of the storehouses and wharves at Chatham, Portsmouth, Woolwich, and Devonport between the two services, and the appointment of separate officers, who would report and account direct. It was easy to imagine the confusion that would arise in war-time by two services drawing on the one common store. This revolution—for it was nothing less—would, he believed, be carried out without involving any extra annual change on the Exchequer, and was to take effect on the 1st of April next. They might consider he had made a mountain out of a molehill, and that it must be a very simple thing to change the charge of articles from one public department to another, and that it ought to matter very little as to which was intrusted with the custody. Both departments served one master—the public. In theory this sounded very plausible, but he assured them that no one unacquainted with official departments could realize the insuperable obstacles presented by such radical changes. Each department was, no doubt, actuated by the best motives to serve the public but the very pride which each took in its work, the *esprit de corps*, resented anything that should increase the responsibility of one at the expense of another. The transfer meant a change of custody of thousands of different articles, worth about 20 millions. No two business firms could feel a stronger rivalry than was oftentimes entertained in their official relationship between officers of different departments."

Sir John Adye's letter to *Times*.

That such a change as Mr. Forwood described should have been criticised by those who have administered under a different system, was but natural. Sir John Adye's powerful pen has been employed in stating the objections to the present decision. He opens a letter, addressed to the *Times*, with an historical retrospect. "The Ordnance Department, which until 1855 provided the armaments and had charge of the reserves of our naval and land forces, had always been regarded as one of the most efficient, whilst it was also one of the most ancient, institutions of the country. Its existence dates back to the days of Richard III., and the Master-General and Board were regularly constituted as such in the reign of Henry VIII. During the 18th century, the office of Master-General was held by such men as the Duke of Marlborough, Lord Ligonier, the Marquis of Granby, and the Duke of Richmond. In the earlier part of the present century it was administered at various times by the Duke of Wellington, and by many of his distinguished comrades—such as Lord Hardinge, Sir James Kempt, Sir George Murray, Lords Beresford, Vivian, and, finally, by Lord Raglan.

History of Ordnance Board.

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"The Master-General was often in the Cabinet, and his Board were usually experienced professional men, and, the majority of them being in Parliament, the Government and the country had thus the benefit of their advice and assistance. This organisation stood the test of the great wars in which this country was engaged. It was inquired into and favourably reported on by various Royal Commissions, and the Duke of Wellington, over and over again, spoke of it in high terms. He stated that its duties were—'supply of the armaments, arms, ammunition, and ordnance stores for the service of the Army, the fleets, and fortresses of this country;' and 'he considered it a pattern for others.' (See Clode's *Military Forces of the Crown*, vol. ii., pages 760, 763–4, 766, and others.) As late as 1849 he warned the Government against making alterations."

Since 1870.

Such was the history of the department up to the era of the Crimean war. Its later phases, as Sir John Adye admits, have not been satisfactory. In 1870 Lord Cardwell attempted to revive the function of the Master-General of Ordnance in the person of a Surveyor-General; but as the office was made parliamentary and political it inevitably fell into inexperienced hands. In 1882 two Royal Commissions, the one presided over by Sir J. Stephen, the other by Sir Matthew Ridley, recommended the revival of the appointment of Master-General of the Ordnance, insisting as a condition of efficiency that it should be filled by a military officer of high rank and experience. In the following year the Government announced their intention to abolish the office as a separate department, and to transfer the supreme control of the manufacturing departments to the Financial Secretary. The decision recently taken at the Admiralty follows as a natural sequel.

Advantages of transfer.

In relation to the supply of armaments, the Admiralty has hitherto held an anomalous position. As users of weapons, often of novel pattern and of unprecedented power, involving corresponding difficulties of manufacture, they have made heavy demands on the War Department. Failure to meet the exacting requirements of the Navy in a period of transition was probably inevitable. It was not the less unsatisfactory, alike to the service and to the public, and whenever it was sought to determine upon whom the responsibility for failure rested the enquiry was invariably abortive. The Admiralty was not wholly free from responsibility, nor yet was it invested with an absolute control. Under the new arrangements the naval authorities will have control and will bear responsibility, at least in regard to the conditions laid down when giving orders for guns.

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CHAPTER V.

Administrative Efficiency.

Efficiency of dock-yard administration.

The following memorandum, published in the *Times* of the 7th October, 1890, gives in a compendious form the leading statistics by which the general efficiency of our dockyard administration may be measured. It is gratifying to observe that the British service compares favourably with those of other Powers. The results are creditable alike to permanent and Parliamentary officials. The memorandum is reprinted *in extenso* from the *Times*:—

Memorandum in *Times*.

"A large sum of money is granted yearly by the House of Commons for the maintenance of the British Navy. This sum is larger than that devoted to naval purposes in any other country. The reason of this is easily given. The United Kingdom, or, more exactly, the British Empire, is the single instance of a great island and maritime State. Its naval force, therefore, occupies a position similar, not to that occupied by any foreign navy, but to that occupied by the land forces of the great military Continental Powers. British naval expenditure should therefore be compared as a whole with the army expenditure of other States of corresponding rank. There is no difficulty now in ascertaining the amount of money which foreign Governments assign to the different branches of their administration. Books so readily accessible as the *Statesman's Year Book* or the *Almanach de Gotha* will give the figures, and where these works may happen to be a little out of date—which depends on the time of year at which the comparison is instituted—newspapers and official publications, on sale or to be procured with but trifling trouble, will furnish the most recent statistics. The total army expenditure of France for 1889 is given as £29,414,850, but a portion was devoted to purposes somewhat akin to those included in our own naval defence shipbuilding programme, and should not, perhaps, be regarded as an annually recurring charge. This latter cannot be reduced below £22,268,686. The Russian army expenditure is put at £21,556,951, and the German at £18,345,258. The gross estimated expenditure on the British Navy for the year 1889–90 was

British naval expenditure compared with military expenditure of foreign powers.

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put at £14,361,810. Thus the estimated cost of the Navy, which is charged with the maritime protection of the whole wide-extended British Empire and its enormously valuable sea-borne trade, was four millions below that of the German Army.

Comparative cost of protecting trade and shipping.

"If we endeavour to compute what it costs a country to perform certain duties which are universally considered as falling to the share of the war navy, we shall find that to protect every £100 worth of sea-borne trade costs Russia £8·2 a year; Italy, £7·8 a year; Germany, £5·03 a year; France, £3·05 a year; and the British Empire, £1·3 a year. To protect each ton of merchant shipping under the national flag costs Russia £9·1 a year; France, £7·8 a year; Italy, £5·07 a year; Germany, £2·3 a year; and the British Empire, £1·1 a year. The comparison is in reality more favourable to the British Empire than the last statement would by itself make apparent, owing to the large preponderance of British steam tonnage, which is capable of much more rapid movement than sailing tonnage. Owing to a steamer's power of making more voyages of the same length in a given time than a sailing vessel, steam tonnage is more effective than sailing tonnage and should be multiplied by a co-efficient to be on an equality with the latter.

Comparison of charges for effective services.

"The foregoing merely shows that the charge for certain services is much lower in the British Empire than in the other great naval States. It throws no light on the question whether the funds set apart for the British Navy are or are not economically administered. We may at least approximate to a solution of, if we cannot completely solve, this question. We can take the sums of money covered by naval expenditure in several of the principal maritime countries and see what share of each should be allotted to various duties which all are agreed fall properly to the province of a navy. We can then compare the share of each particular branch of naval efficiency in the total cost as shown by the figures for one country with that shown by the figures for another. To make the comparison as exact as possible, it will be necessary to take note of the variety of forms in which the Naval Budgets of the countries considered are drawn up. Germany, Russia, and the United States do not include in their Navy Estimates what in England are called non-effective charges. France and Italy include only a portion of these charges. It is necessary, therefore, to take as the basis of comparison the estimate for effective services only. There are still some differences which it will be necessary to eliminate before beginning to compare; and the several estimates must be reduced, as it were, to a common level. From the total French estimate of £8,943,034 the following deduc-

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tions have to be made—sums properly belonging to the non-effective charges; half the charge for marines, to allow for the numbers of French marines in excess of the British marines serving on shore; rather more than half the total charge for sea-transport as the land-service share of this charge which is not now included in the British Navy Estimates. The reduced French Navy estimate is thus made out to be £7,802,302. Deducting from the German estimates charges which resemble those connected with our naval defence programme, and allowing for the expenditure, as far as it can be ascertained, on coast defences, we have a reduced total of £3,198,187. Corresponding deductions bring the Italian estimate of more than five millions down to £4,491,470. From the Russian, United States, and British (1890–91) estimates for effective services no deductions need be made. The exclusion of charges which may be considered as belonging to those connected with naval defence programmes has already been noted in the case of Germany. This exclusion has been made in all cases where it was necessary.

Comparison of fighting efficiency.

"Every one will admit that a fair, perhaps the only practicable, measure or test of the fighting efficiency of a navy that can be applied in time of peace is the amount of force ready for immediate use which it can maintain habitually. The tonnage, engine-power (I.H.P.), and strength of the crews of the sea-going fighting ships usually in commission will supply the necessary *data*. Other services are in reality subsidiary to the purpose indicated—namely, that of keeping up a certain peace effective of the fighting classes. Periodical lists, answering to our Navy List, are, as a rule, issued in foreign countries only as annuals, and a proper comparison must be that of contemporary conditions. The following table gives us, in addition to the latest estimates of naval expenditure, a picture of the more important navies as they were in January last:—

	"Effective" Navy Estimates.	Sea-going Fighting Ships in Commission.		
		Displacement.	Engine-power.	Crews.
	£	Tons.	I.H.P.	
France	7,802,302	166,392	139,139	14,542
Italy	4,491,470	94,444	108,625	5,557
Germany	3,198,187	63,861	67,020	5,600
United States . . .	3,271,548	50,191	48,615	5,456
Russia	3,919,355	44,793	51,858	4,807
Great Britain . . .	12,425,587	406,548	407,626	28,156

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Share of effective expenditure borne by each unit of fighting efficiency.

"The share of the total effective expenditure borne by each unit of the above elements of fighting efficiency will be found in the next table. The cost of each unit would, of course, be very considerably less :—

	Per Ton.	Per I.H.P.	Per Man.
	£	£	£
France	46 9	56·07	536·5
Italy	47·5	41·3	808·2
Germany . . .	50·08	47·7	571·1
United States . . .	65·1	67·2	599·6
Russia	87·5	75·5	815·3
Great Britain . . .	30·5	30·4	441 3

"The expenditure to obtain a given result is in every item greatly in favour of the British Navy as regards economy. Though some allowance should be made for the necessarily, or reasonably anticipated, superior economy due to the single management of a larger force, an examination of the table will show that this by no means accounts for the whole of the striking inferiority of the British figures.

Cost per man of naval expenditure.

"If we deduct from the French estimates the whole charge for the marine troops, who do not go afloat, and divide the effective expenditure, as estimated, amongst the total naval *personnel* wherever employed, we should find that in France the share per head is £204·3; in Italy, £189·7; in Germany, 210·6; in the United States, £258·0; in Russia, £131·6; and in Great Britain, £180·6. Here the charge is lower for Great Britain than for every other country except Russia. This is especially significant, because in no other country, except the United States, is the recruiting voluntary, and in none, except the last named, is the cost per head so high as with us. The British Navy has not only to enter the labour market as a competitor; it has also to enter it in direct competition with another employer of exactly the same class of skilled labour as it requires itself—namely, the mercantile marine. The fact that the figures are kept down to those given may be fairly attributed to the more economical administration of the British Admiralty. The first cost of naval *matériel* differs only by a moderate percentage in all the maritime countries of the world. Of course the foregoing statements only prove that our Navy is more frugally administered than others. Let the expense of any other British Government department be compared in a similar manner with that of the corresponding department

Superior economy of British naval administration.

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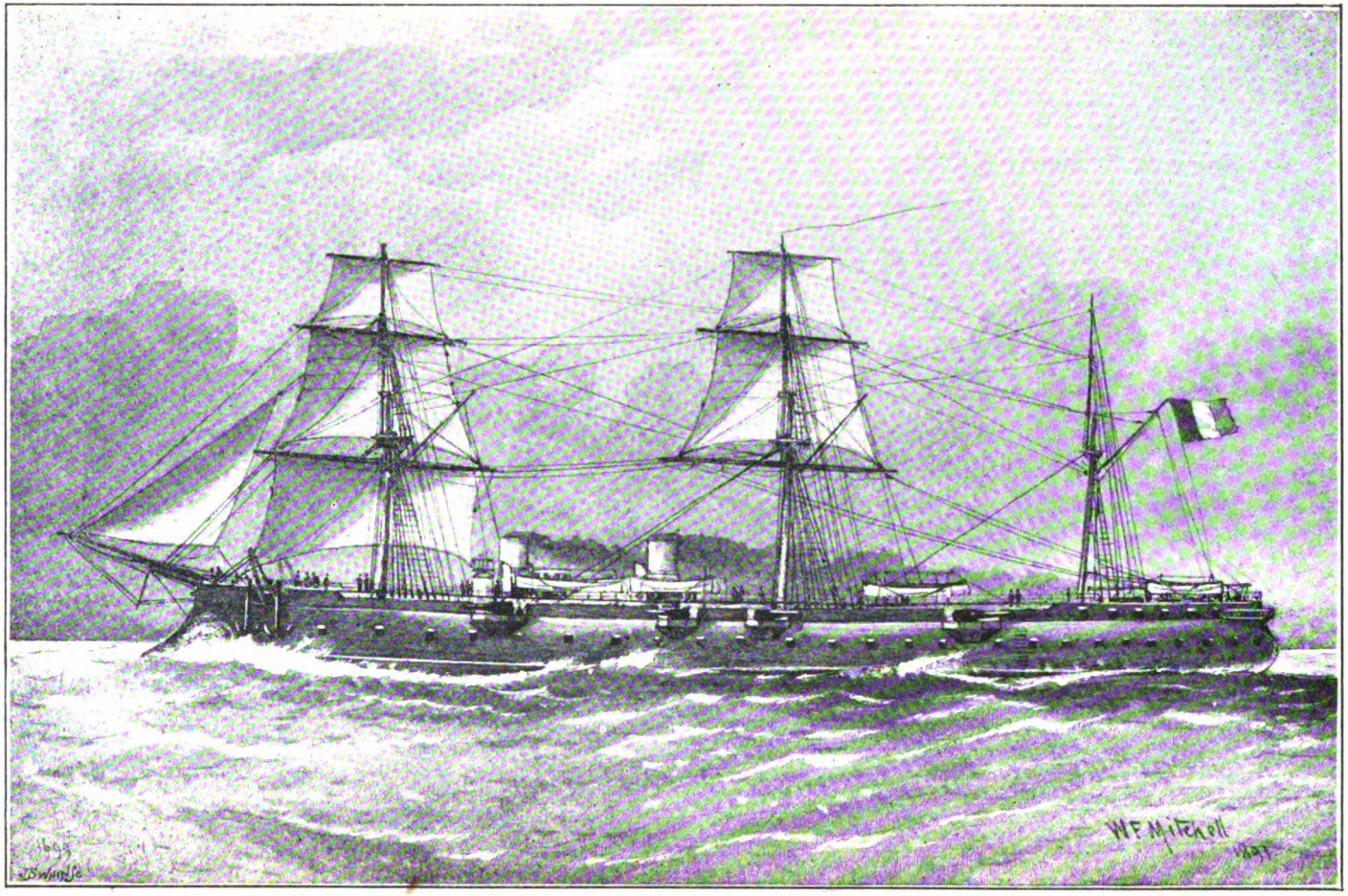

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in the foreign States of like importance, and the superior economy will by no means invariably, if ever, be found to be upon our side. The two results together should supply a satisfactory proof at least of this, that our naval administration gets more than most institutions out of the sums of money placed at its disposal."

Disadvantages of a public establishment.

In the administration of the dockyards there are conditions inherent in the constitution of a public establishment, and arising out of the objects for which it is maintained, which must always make it difficult to do work as cheaply as it can be done in private yards. The business is not undertaken primarily with the view to profit. The officers who superintend are remunerated on a fixed scale, and not by percentage. A large proportion of the workmen are paid by time and not by results.

Rapid construction in dockyards.

Whenever the stimulus of piece-work can be applied we have no reason to be dissatisfied with the rate of progress in construction. The Royal Arthur, a first-class cruiser, of 7,700 tons, recently launched by Her Majesty, had been built with marvellous rapidity. A wholesome rivalry exists between the men of the various dockyards. At Chatham a total weight of 5,400 tons was built into the first-class battle-ship, the Hood, in fourteen months. At Portsmouth in twelve months a total weight of 5,200 tons was built into the sister ship, the Royal Sovereign. The performance has never been surpassed in the annals of ship construction.

French ship-building.

We have gained in a remarkable degree upon the French yards. The following table shews the ironclads now in construction in the Government yards in France, as given in the French Navy Estimates for 1892.

Class.	Name.	Commenced.	State of Advancement will be on 1st January, 1892, in hundredths.
Ironclads	Neptune	1882	97
	Brennus	Jan. 1889	62
	Tréhouart	„ 1889	32
	Magenta	„ 1883	88
Armoured Gunboats	Phlegeton	March 1885	91
	Styx	Sept. 1889	69
Armoured Cruisers	Dupuy-de-Lôme	July 1888	77
	Charner	June 1889	35
	Bruix	Oct. 1890	8
Cruisers, 1st Class.	Alger	Nov. 1887	100
	Isly	Sept. 1887	62
Cruiser, 2nd Class.	Suchet	Oct. 1887	39
Torpedo-Cruiser	Wattignies	Oct. 1889	100

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The time occupied in building in Her Majesty's yards may be taken at four years for a first-class battle-ship, three years for a first-class cruiser, two years and a half for second-class cruisers, and two years for third-class cruisers.

Ships in construction in France and England.

A comparison of the French and English Navy Estimates affords some interesting subjects of reflection, both in reference to the efficiency of the labour of the men, and the distribution of expenditure as between repairs and new construction. In the French dockyards 19,555 men are employed, as against 20,956 men in the English yards. The ships building and completing are shown in the following tables:—

	France.	England.
Ironclads	6	7
Armoured gunboats	2	..
Armoured cruisers	3	..
Cruisers, 1st class	2	4
„ 2nd „	4	31
„ 3rd „	..	5
Torpedo-cruisers	2	..
Transports	2	..
„ 2nd class	1	..
Torpedo-sloops	2	7
Torpedo depôt-ship	..	Vulcan
Total	24	55

Repairs.

The expenditure on repairs, a most unsatisfactory feature of naval expenditure in former years, is being steadily reduced, under the vigilant supervision of Mr. Forwood and Admiral Hopkins. The amounts expended during a long series of years on reconstructions, alterations, and maintenance, are given in the table herewith:—

	£
1891-92	789,412*
1890-91	1,085,470*
1889-90	926,291
1888-89	774,071

* Of these amounts, in 1890-91, the sum of £246,779 is chargeable to reconstruction. The corresponding amount for 1891-92 is £128,824.

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	£
1887–88	828,410
1886–87	914,123
1885–86	1,691,019
1884–85	1,014,813
1883–84	926,179
1882–83	877,697
1881–82	691,080
1880–81	841,710
1879–80	822,220
1878–79	1,064,151
1877–78	1,069,425

Superior economy of refits in dockyards abroad.

We are deriving much advantage from the construction of ships in durable materials. Hulls built of steel are less costly for maintenance than were the hulls of wood-built and composite vessels. We are utilising the resources of our dockyards abroad more thoroughly for repairs and maintenance. Ships can be prepared for re-commission on foreign stations at less cost than at home, partly because they are presumably in a fairly effective condition, and partly because they are not under the observation of the gunnery department; and extensive re-armaments, rarely worth the heavy cost incurred, are not pressed upon the administration.

Repairs at Toulon.

In France, perhaps in a greater degree than with us, wasteful expenditure is incurred in alterations and improvements demanded by officers in command, who, in their desire to make ships perfect, do not sufficiently consider the question of cost. The case of Toulon is specially mentioned in an article by M. Weyl. At Toulon 4,500 workmen are employed. More than half the labour at the yard is devoted to repairs, chiefly undertaken to meet the requirements of the squadron of evolution in the Mediterranean, which is rarely exposed to bad weather.

Increase of pay to dockyard workmen.

For many years the workmen employed in our dockyards have been urging their grievances on the attention of the Admiralty. Mr. Forwood has personally visited the yards, generously devoting his holiday to the cause of justice to the workmen. The value attaching to the pensions and other privileges enjoyed in the public service, estimated by the workmen at one shilling and by the authorities at three shillings a week, has been one of the principal matters in dispute. Mr. Forwood has recommended an advance of pay to

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various classes of workmen, which will impose an additional charge on the estimates of £72,000 for the year 1891–92.

Efficiency of workmen.

It is satisfactory to know that, as the result of a close and sustained observation, Mr. Forwood has felt justified in speaking publicly in terms of the highest praise of the general efficiency of dockyard workmen. The compiler may claim to have had some opportunities of forming an opinion; and it was not unfavourable. Under a system of payment by the hour, and without classification according to efficiency, it is the universal experience of employers of labour that energy and industry will not be fully developed. The Admiralty have wisely decided that the advance of pay which is now given shall be accompanied by a classification of workmen. The large amount of new construction now in progress affords the opportunity for paying an increased number of men by the piece.

Engines built in dockyards.

The policy of building the engines for Her Majesty's ships in the dockyards is a new feature of the year 1890. The Admiralty wisely began by an experiment on a limited scale. Sheerness and Chatham were entrusted with an order for the machinery for certain gunboats. These engines having been entirely successful, it has been decided to construct more powerful machinery in the royal yards. The engines for the Phœbe, of 7,500 I.H.P., are to be built at Devonport.

Work done hitherto by private firms.

As the *Broad Arrow* has recently observed, "The significance of the new move will be appreciated, when it is remembered that many London firms practically live by Government engineering contracts. Humphreys & Tennant in a comparatively few years have drawn about two and a half millions; Penn, one and a half million; Maudslay, one and a third million; and Hawthorn Leslie, on the Tyne, half a million; while for engines for ships built in the royal yards, as well as on the Clyde, Messrs. Napier have taken considerably over half a million; Elder, of Fairfield, £400,000; Thomson, £350,000; and others corresponding amounts. Of course private firms will still get orders, but they will be fewer, and the competition of Government establishments will mean less profit."

The decision to undertake the building of engines in the dockyards was prompted by the desire to keep together a body of workmen, who, in case of an emergency, would be urgently required for the equipment and repair of the fleet, and who, owing to the satisfactory reduction in the demands for repairs, must have been discharged from the service unless profitable employment in building engines had been found for them.

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Trials of French machinery.

In quality of work our royal yards will bear comparison with the public establishments of foreign powers. Several recent cases of breakdown of machinery of new vessels have been the subject of discussion in the French Chamber of Deputies. A revision has been made of the regulations for conducting the trials of machinery, and they are now assimilated to those established by the British Admiralty.

Defective boiler-tubes in English vessels.

French men-of-war, armed for the first time or having undergone important alterations, are to make a sea-trial lasting twenty-four hours without interruption, of which two hours shall be at the maximum speed, with forced draught, but only to obtain a pressure not exceeding that which, at the trials on receipt of the ship, would have given nine-tenths of the maximum speed then realised. Similar provisions are made for vessels coming from the first and second categories of the Reserve; and the vessels which remain in those categories must, at least once a year, make like trials of twenty-four hours in addition to the three-monthly trials, which have for their object to test the working condition of the machinery.

Admitted failure of new engines to give results anticipated.

Cases of breakdown in the engine-room in our vessels newly commissioned have not been rare in recent experience. In numerous instances the failure has been due to defective boiler-tubes. The replies to questions on this point asked in the House of Commons not being in his judgment satisfactory, Lord Randolph Churchill moved for a return of boiler and condenser tubes, delivered since January 1st, 1888, showing rejections. It appears from the returns that the condenser tubes have stood well. Of the steel boiler-tubes a large proportion were rejected.

In his recent memorandum, Lord George Hamilton has, with excellent judgment, admitted that the engines lately supplied to Her Majesty's ships have not given the results which had been anticipated. He has explained that the leakage of boiler-tubes has been traced to a want of circulation of water over the tube-plates. The number of tubes has in consequence been reduced, with highly satisfactory results. In the desire to beat all recorded performances an excessive strain has been imposed on boilers and machinery. Larger and heavier boilers are to be provided for the new ships, and the attempt to obtain extreme results in those already supplied has been abandoned.

A rumour has been circulated in the Press that the Admiralty have decided on handing over the Indian troop-ships to the Indian Government in 1894. A large number of officers, and 1000 men,

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Wasteful expenditure on trooping service.

are now employed in these vessels. Their services are now required for manning the numerous new ships which are being added to the Navy. The machinery and hulls of ships in reserve will be kept in better condition for immediate service by the appointment to each ship of a sufficient nucleus of the crew. This is being done in the French Navy. Naval reformers in France criticise with extreme and well-merited severity the lavish waste of public money on the trooping service.

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CHAPTER VI.

The Importance of Naval Power to England.

That our naval administration should be efficient is becoming year by year in a higher sense of the gravest national concern. The Admiralty are charged with the care of a department which, to use the words of Captain Mahan, "has for its end to found, support, and increase, as well in peace as in war, the sea-power of the country." Captain Mahan has shown in his admirable volume, the publication of which is one of the most important naval incidents of the year, how sea-power told upon the course of history throughout the eighteenth century. Captain Mahan's work.

Under modern conditions we accept it as a stern necessity of the time that a nation which desires to maintain its rights must be in a position to command respect. "International morality," as Mr. Dicey has well said, "is due in great measure, not to moral force, but to physical force, in the shape of armies and navies." The impression produced abroad by adequate naval preparation is illustrated in some observations recently published in the *Revue du Cercle Militaire*, in an article on "The Offensive Strength of England." Mr. Dicey.

"In an age, when might overcomes right, and when the credit of a State is measured in general by the number of bayonets it can put in the field, military writers pause with curiosity before an organisation which seems an anachronism in the presence of Europe under arms. A continent, almost entire, annexed without the loss of a man or a shilling, the English alliance sought at any price by the Triple Alliance, the English name everywhere respected or feared; and yet, to bring to the front so many enterprises, to support so many claims, and secure the recognition of so many rights, a permanent Army of 200,000 men, of whom 100,000 are dispersed throughout the globe, while the other 100,000, stationed in the United Kingdom, cannot be mobilised rapidly enough to intervene usefully in an external conflict! Is there not enough in this striking contrast to justify the astonishment both of soldiers and politicians?" *Revue du Cercle Militaire* on offensive strength of England.

A writer in the *Army and Navy Gazette*, commenting on these observations, appropriately remarks that "there is a fact which, for *Army and Navy Gazette.*

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the good of England, cannot be made too plain—that she owes her advantage to her island position in the midway of commerce, which has given her dominion of the seas, whereby she secured, and has since maintained, both her distant Empire and her central power. In fact, the strength of England is no such phenomenon as the *Revue* in its partial analysis would seem to imply, but can, with historical examples, be very clearly explained."

Change of foreign policy to colonial policy.

At the present time our interests abroad are more than ever dependent on the power which we can wield upon the seas. We should not repeat the struggles of the Crimean war. Constantinople is no longer regarded as the key of India; and the maintenance of the Ottoman empire in Europe is no longer held by the responsible statesmen of either political party to be the exclusive concern of the British Government. If it were thought fit, our Navy could make the occupation of Constantinople by a hostile power impossible; but we should not be disposed to take action apart from Germany and Austria, whose interests are more directly concerned. To secure our Indian frontier from invasion, and our commerce and communications with the colonies from interruption, is the chief care of an English minister of foreign affairs. More and more the foreign policy of Great Britain has become a colonial policy, that is to say, a policy directed to the preservation of interests which are equally the concern of the colonies and the mother-country. If we wish to preserve the colonial connection we shall not fetter ourselves by alliances and engagements to preserve the balance of power in Europe. In a policy thus limited, as the writer of "Imperial Defence" has truly said, there is no abdication of rightful responsibility. The strong arm of England need not be weakened because the direction of its sweep is not predetermined. If we are supreme on the seas our alliance will be always courted.

The command of the seas makes costly forts for the defence of London unnecessary. It is the best and cheapest defence for our arsenals and commercial harbours.

Dependence of British Empire on Navy.

The able author of the recently published pamphlet on "Imperial Defence," in a few graphic sentences, emphasizes the dependence of the British Empire on the strength of the Navy.

"An adequate Navy, fully prepared for war, is the prime condition of national existence, and the first postulate of imperial defence. It was estimated by Lord Carnarvon's Commission that British property of the value of £144,000,000 is always afloat; but this enormous figure, since increased, represents only one of the hostages we have given to war. The empire is connected by ocean

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roads alone. Unless these roads can be preserved practically inviolate, the whole fabric will inevitably dissolve. To an empire built up on commerce the loss of the command of the seas means ruin. Spain and Holland, unable to retain the command of the seas, sank to second-rate powers—'a lesson to us that a change of dynasty sometimes takes place in the sovereignty of the sea.'"

If we retain our naval supremacy we shall never be crushed by attacks directed solely upon our commerce. As Captain Mahan justly observes, "only by military command of the sea, by prolonged control of the strategic centres of commerce, can such an attack be fatal; and such control can be wrung from a powerful Navy only by fighting and overcoming it."

Transfer to neutral flag.

It has been contended that it is unnecessary to incur an enormous expense to provide for the defence of our commerce by sea, on the ground that on the outbreak of war the carrying trade must inevitably pass under a neutral flag. A considerable transfer of tonnage may be anticipated, though not on so extensive a scale as to render protection by the Navy no longer indispensable.

National insurance. Sir G. Tryon's proposals.

This question brings up for consideration Sir George Tryon's proposition for a national insurance, or guarantee for the reimbursement of losses from the capture of vessels and cargoes by an enemy. Sir George Tryon contends that, provided we avoid routes that are dangerous owing to geographical conditions, it will not be easy to greatly interfere with trade and commerce carried in reasonably fast vessels. He thinks it essential that in the interest of the nation losses by capture should be borne by the State, arguing that in time of war the rate of insurance would be enormously high, and that should our shipowners lay up their vessels or get rid of them to foreigners, the State would not undertake the duties they now discharge in the supply of food, the import of raw materials, and the export of manufactured goods. It has been urged in objection to Sir George Tryon's view that the State could not fix the rate of premium, and that there is no sinking fund out of which the necessary payments could be made. Impressed with this difficulty, Lord Charles Beresford is of opinion that national insurance is impracticable, and that a strong Navy is the only resource for the protection of commerce.

View of Major Clarke.

It does not appear that the proposal for a national insurance of the mercantile marine, and the arguments in favour of the reinforcement of the Navy, conflict. Rather they should be regarded as interdependent and complemental. The true view is that expressed by Major Clarke. Fleets maintained at a strength sufficient to meet

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all probable demands, and reserves ready to provide for rapid expansion on the outbreak of war, are the first necessities of our national existence. If we create and maintain powerful fleets and sufficient reserves, a system of insurance, as proposed by Sir George Tryon, need involve no real burden to the State, but would effectually check panic.

Capture of private property at sea.

The capture of private property at sea is an admitted principle in international law. The immunity of private property has been proposed at frequent intervals by high authorities. It was approved by President Pierce in his message to Congress of the 4th December, 1854. It was the subject of motions in the House of Commons by Mr. Horsfall in March, 1862, and by Sir W. Gregory in March, 1866. It was recommended by the Associated Chambers of Commerce in February, 1866; and in the war between Austria and Prussia the capture of private property was renounced on both sides. The right was again asserted by France in 1870. It may be argued that wars are waged, not between individuals, but between nations, and that as the house of a private individual cannot be seized, so ships should not be regarded as a lawful prize. It is certain that the destruction of merchant ships will never reduce an enemy to submission. In the Franco-German war, 75 merchant ships were taken by the French cruisers. The opinion expressed by Lord Palmerston at Liverpool has been abundantly justified by experience. "Never has it happened that a country has been brought to submission by the private losses sustained by its individual citizens." M. de Laveleye, in a pamphlet published in 1875, has argued that no country can suffer so much as England by the interruption of commerce. The imports of raw materials and exports of manufactured goods, on which the trade of the country depends, could not be undertaken by the merchant fleets of the neutral Powers. The capture of private property at sea may operate to the disadvantage of England, but never to her advantage.

England as sensitive of national honour as formerly.

There is no reason to fear that the wave of democratic thought and feeling which has passed over England, in common with all other European countries, brings with it a less sensitive feeling of national honour, indifference as to security from invasion, or unwillingness to bear taxation, whenever it can be shown to be necessary to provide the means of defence for our world-wide empire, and great and extending commerce. In proof of the existence of a strong patriotic sentiment, we may point with pride to the Volunteer movement, which, with little encouragement from the authorities in its beginning, has become permanently established as one of the most reliable and

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expansive, as it is certainly the least costly, means of defence which have been created at any period or by any nation.

Proportion of naval expenditure to revenue.

The general recognition of the value of sea-power for the maintenance of the British Empire in security has been shown in a practical form by the liberality of Parliament in dealing with the Navy Estimates. This point was well brought out in the statistics recently given by Lord George Hamilton. Comparing the naval expenditure of the five great naval Powers of Europe, it appeared that, out of a total gross revenue of £89,000,000, England spent £15,600,000 on its Navy, or 17 per cent. In France, out of a revenue of £123,000,000, the naval expenditure was £8,300,000, or 7 per cent. In Germany the total revenue was £60,000,000, of which £4,600,000 was devoted to the Navy, or 8 per cent.; while in Italy, out of £72,000,000, the Navy absorbed £5,000,000, or 7 per cent.; and in Russia, out of £94,000,000, the Navy received £4,300,000, or 4½ per cent.

We have done wisely in meeting our obligations for naval defence, to a larger extent than has been done elsewhere, out of the revenue of the year. The great additions to the Navy which have been lately made will have been provided for without accumulating a load of debt, to be borne by succeeding generations.

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CHAPTER VII.

TRAINING AND EDUCATION.

Admiral Hornby's views.

THE training of seamen has been ably discussed in the papers recently contributed by Admiral Hornby to the *United Service Magazine*. He recommended that twelve training-ships should be maintained for the Navy, with twenty-four sea-going cruising tenders, averaging 900 tons each. These twenty-four clippers would train 4,400 young seamen, a considerably larger number than it is possible to send to sea in a Channel squadron. Boys should pass into the Navy from sea-going training-ships.

Necessity for increase of number of boys.

An increase in the number of boys in training is pressed by Admiral Hornby, on the ground that the existing number of seamen is not sufficient to man the effective ships on the Navy list. Owing to the rapid disappearance of sailing-ships the mercantile marine can no longer be available as a nursery of seamen for the fleet. Sir Geoffrey Hornby desires that the Navy should do its own training, turning over its trained men, who have not become petty-officers, to the mercantile marine, after a certain period of service in the Navy.

While recommending developments and improvements, Admiral Hornby considers the existing system of training by no means unsatisfactory. He chiefly regrets that we recruit too largely for the Navy from the towns.

Value of sailing-ships for training.

In insisting on the value of sailing-ships of moderate dimensions for the purpose of training, Admiral Hornby has the support of the great majority of naval officers. The handling of a sailing-ship at sea under all conditions of weather stimulates the faculties as no other experience can.

Gunnery.

In reference to the recent transference of the gunnery establishment at Portsmouth to Whale Island, and the abandonment of the Excellent as a living-place and drill-ship, the *Army and Navy Gazette* remarked that "there cannot be any question as to the value of the change thus effected from whatever point of view regarded. Another step in the right direction is the determination of the authorities that for the future all practice with big guns shall

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be carried out afloat where the conditions approach more nearly to those found in actual service. There is one further alteration in the course of instruction we would suggest, and this is, that in their final exercise the men be trained to fire from the Hero, or some other tender, at a moving hulk painted to represent an armourclad with turrets or barbettes, partially unarmoured spaces, conning-tower, &c. This would not only give us information and data, but help to train the men in a manner which no firing at a fixed target can do."

Entry of naval officers.

The entry and training of naval officers was recently brought before the Royal United Service Institution in an able paper by Rear-Admiral Bowden-Smith. He proposed that cadetships should be open to public competition; that marks should be given for other modern languages as well as for French, and also for athletic or gymnastic exercises; and that candidates under fifteen years of age who pass the test examination but fail in the competitive, should be allowed a second trial.

Admiral Bowden-Smith.

Admiral Mayne.

In the discussion which followed, Admiral Mayne strongly urged that young officers should go straight to sea from public schools. He would as soon take a boy who had passed a good examination in Latin and Greek as one who had passed successfully in mathematics. He considered it a great mistake to neglect the teaching of languages —both the living and dead languages—as the latter would assist the student very materially in studying the former afterwards. It would be greatly to the advantage of the Service, if, without drawing a hard and fast line, officers were not promoted without subsequent examination; that they should have something in the nature of a Staff College, and that they should be obliged in the ordinary way to pass an examination for the position of commander or captain. The best place for training a sailor was the sea itself.

Chief Engineer Edwards.

Chief Engineer Edwards urged the desirability of the man who had charge of a ship being a practical engineer himself.

Admiral Cleveland.

Admiral Cleveland spoke of the value of technical education in the knowledge of gunnery, but contended that boys did not require this knowledge at the age of fifteen or sixteen, and maintained that, under the present system, we did not get it. Technical training was best obtained on the sea.

Admiral Colomb.

Admiral Colomb said that simplicity of character had always been the distinguishing mark of an English officer. His greatest defect was with reference to the learning of languages.

Encouragement of modern languages.

The Admiralty are making an effort to encourage the study of modern languages in the fleet. Liberal prizes have been offered for proficiency in French, German, Italian, and Spanish. At Malta

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a grant has been made in payment for instruction in French on board the ships in harbour.

High mathematical attainments not indispensable.

With reference to naval education generally, it would appear that the tendency of late has been to require too high a standard of mathematical knowledge in the general body of officers. Skill in handling a ship in a gale of wind, dash and judgment in action, are qualities not dependent on mathematical attainments. It is now proposed not to require more for passing in mathematics at Greenwich than has previously been learned on board the Britannia. Opportunity will, however, be given for higher study to officers with a turn for mathematical subjects. A certain number of mathematicians are needed in the Navy.

Cadets should go first into masted ships.

It is most desirable that cadets, on leaving the Britannia, should go into masted ships. Young officers serving in ships in which no instruction can be given in seamanship would be much better on shore. In mastless ships time at sea is spent chiefly in the school-room, in the study of mathematics. Additional study at sea is a change of recent introduction, which is being found by experience to have been a mistake.

Admiral de la Gravière.

The mode in which the many qualifications required in the naval officer can be best acquired, has been well described by Admiral de la Gravière:—

"De tous les faits que je viens de rappeler, de ceux que je me promets de raconter encore, il me semble bien que je peux tirer sans crainte cette conclusion: la mer, pour les marins, sera toujours la grande école de combat. Plus la mer sera dure, meilleure sera l'école. Commençons donc par être marins, et pour le devenir, recherchons, comme on cherche un bon précepteur, les navigations difficiles. J'ai répeté jusqu'à satiété par quels moyens j'entendais qu'on poursuivit ce résultat. Lignes de paquebots subventionnées, escales fréquentes, échange continu de personnel entre les grandes compagnies et l'État, brevets d'interprètes, examens de pilotage, encouragements à l'audace, indulgence pour les sinistres, je crois n'avoir rien oublié."

Advantages of Britannia.

The floating school established on board the Britannia leaves nothing to be desired in its educational appliances. Among the recent improvements may be mentioned the admirably fitted-up seamanship-room and the new models for the study of the steam-engine. The working of the cylinders and surface-condensers, and the other parts of the marine steam-engine are shown by means of half-sections. Seamanship is not neglected. The tender to the Britannia, the Wave, is found useful for instruction; and the flotilla

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of sailing-boats is a most popular source of amusement. The recreation of the cadets is provided for on a scale of unsurpassed liberality. Cricket grounds, lawn tennis, racquet and fives-courts, a gymnasium, a pack of beagles, a swimming-bath on the Britannia, abundant facilities for bathing from the shore, afford evidence of the care and consideration of the nation for the future officers of the Navy. The dietary is all that can be desired. The selection of Dartmouth for a naval school is open to question. The climate is relaxing, but the general appearance of the cadets is nevertheless good. The age of admission has recently been advanced to fourteen years. This is a wise step, though it involves the exercise of increased vigilance on the part of the authorities to maintain discipline. Power should be given to those in charge to get rid of any lad who may be convicted of ungentlemanly conduct, and who is therefore unfit to hold a commission in the Navy.

Manning.

In connection with the manning of the Navy, it is gratifying to note the declarations contained in the memorandum recently issued by Lord George Hamilton. Every statesman who holds the position of First Lord of the Admiralty must accept as a governing principle, that in time of peace the Navy Estimates will be kept within reasonable limits. To provide a permanent force sufficient to man all the ships built, building, and in the near future to be built, involves enormous expenditure. To the cost of training, pay, and pension, we have to add a sum not easily to be calculated for the repair and maintenance of the ships, which must be kept in commission in order to give the seamen of the fleet due experience at sea. If we can partly man the Navy with men who gain their experience, their sea-legs, and their seamanship, in the merchant service and not at the public expense, a great saving will have been effected.

Necessity for organising reserve of men from merchant service.

The necessity for organising a reserve for the Navy among the seafaring population of the country has been fully recognised by other Powers. In no other country is it attempted to raise men from their boyhood for the Navy, in the proportions which have been reached in the British service. It is easy to understand the preference shown by officers for men entered at an early age and perfectly trained. A crew consisting largely of reserve men would give more trouble. But trouble is a word which should have no meaning where the public interests are at stake.

Manner in which they should be employed.

The Naval Reserve will not supply captains-of-guns or men competent for the manipulation of complicated mechanism. It is not only for first-class ironclads that in war a heavy demand would be made on our resources for manning the Navy. The look-out ships,

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the cruisers, and the older ironclads on foreign stations would require large numbers, and the reserves would help materially to provide the complements required.

It has been alleged that the merchant service is deteriorating. It is certain that, with the extended use of steam, the mercantile marine cannot supply so many men as heretofore, accustomed to reef top-sails at night and in stormy weather. We still, however, employ sailing-vessels for the colonial voyages, and the rapid passages now made, with reduced crews, are an evidence that the art of seamanship has not been lost.

Second-class reserve.

It may be urged that if the first-class reserve be accepted as a help to the Navy, we cannot place the same reliance on the second-class reserve. The latter, however, is drawn from the same class from which nearly all the seafaring men are obtained who are enrolled in the French Inscription Maritime and the German Seewehr. The fisheries are the chief nursery of the seafaring population of France. In the United States the enrolment of a similar class for the sea-service has recently been sanctioned. In 1887 Secretary Whitehouse carried through Congress a Bill, providing for the enrolment in a Naval Militia of men employed in yachts, who should be organised into artillery and torpedo-corps for coast-defence. The men in the Militia may volunteer for the Naval Reserve for a period not exceeding five years, during which they will be liable to serve in sea-going ships. Our own second-class reserve would be well fitted for coast, channel, and harbour-defence ships, gunboats, and the torpedo flotilla.

Turning to the reserve of seamen of the first and second-class, it is satisfactory to know that the numbers are not far below the strength required by the Admiralty.

Suggestions for encouragement of Naval Reserve.

Some suggestions which have already been put forward are once more pressed by the compiler on the consideration of the authorities. It is desirable to establish drill batteries for the reserve at Bombay, Calcutta, Mauritius, Sydney, and Melbourne. Ships are sometimes detained for a considerable time at these ports, waiting for cargoes. The interval might be utilised with much advantage in putting the crews through their gun-drill.

We have not as yet attempted to encourage Naval Reserve men to gain efficiency by the incentive of additional pay. In the Navy a number of petty ratings have been created as a stimulus to attention to drill and general good conduct. The system thus pursued should be extended more liberally to the reserve.

In reviewing the Naval history of 1890, we cannot omit reference

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to the appeal from the rank and file of the Navy for promotion to commissioned rank. The proposal is approved by Sir Geoffrey Hornby. In a letter to the *Times*, he observes :—

Promotion of warrant officers to commissioned rank.

Sir G. Hornby.

"A claim for promotion from the warrant to commissioned rank in the Navy may rest on a stronger ground than the privilege enjoyed by the sister service—namely, that of an old and beneficial custom. Macaulay has told us that Sir Christopher Mings entered the service as a cabin boy; that his cabin boy was Sir John Narborough; and the cabin boy of Sir John Narborough was Sir Cloudesley Shovel.

"Later tradition credits Lord Howe's master in the Queen Charlotte as rising in the same way; and I can remember a port admiral at Plymouth, who took a very distinguished part at the battle of Trafalgar, and was said to have entered the service before the mast."

Captain Price.

The appeal, made through the press, was renewed in the House of Commons by Captain Price, who contended that the duties of lieutenant would be efficiently performed by men promoted from the warrant-officers' list. There is reason to believe that Captain Price was the spokesman of a limited number of those concerned. Two promotions have recently been made from the rank of warrant-officer to lieutenant, and the officers affected have not found themselves better off in their new position. It is evident that promotions from the ranks to the ward-room must be comparatively few, and cannot confer any real benefit unless suitable commands are reserved for the officers promoted.

Deficiencies in number of lieutenants will be supplied from increased number entered,

Little importance attaches to the question of the promotion of warrant-officers, as a means of supplying any deficiencies in the lieutenants' list in time of war. As Sir George Richards has shown, the present temporary difficulty will be remedied in a short time. He points out that there are now 839 lieutenants on the active list, 155 sub-lieutenants eligible for lieutenants, 389 midshipmen (of whom 150 would be eligible in about a year), 36 naval cadets, and a yearly supply from the Britannia of over 100. We have a considerable body of officers in the troop-ships, and a certain number in the Coast Guard, most of whom would be available immediately for the fighting ships.

Coast guard,

Naval Reserve.

Behind the Navy we have the Naval Reserve. Steps are being taken to place the list of lieutenants of the reserve engineers on an effective and satisfactory footing. Under the Act constituting the Naval Reserve, the force was to consist of 150 lieutenants, 270 sub-lieutenants, 150 engineers, and 150 assistant-engineers. We are far short of these numbers, and the majority of those on the list are not

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sufficiently trained. Under regulations recently issued officers of the Royal Naval Reserve are allowed to serve for twelve months in the Navy. Twenty officers have already completed their period of service. Twelve months' service in the Navy should in future be made compulsory before a sub-lieutenant of the Naval Reserve is promoted to lieutenant. From those who, having gained their experience at sea in the mercantile marine, have become acquainted with the discipline of the Navy by actual service and by a periodical course of instruction in a gunnery school, we shall be able to create a reliable reserve. The numbers required should be fixed from time to time with reference to the strength of the Navy in ships. It is certain that the enrolment of suitable men from the mercantile marine can be increased to any required standard by the offer of an adequate retainer.

Reserve of engineers.

We may secure a reserve of engineers from the same source. With the aid of a committee of shipowners, associated with the Admiral Superintendent of the Reserves, regulations could be framed which would enable the Admiralty to enrol engineers fully qualified, who could be spared without disorganising the merchant service. Men would readily enter, if sufficient inducements were held out.

Royal Naval Artillery Volunteers.

The Royal Naval Artillery Volunteers continue with unabated zeal to do their best to command the confidence of the Admiralty. Their usefulness is seriously diminished by the ambition to be regarded as belonging to the seaman class. With few exceptions the claim is not warranted by personal qualifications. The corps should be reorganised as a body of Volunteer Marine Artillery.

Training of officers of merchant service in United States.

In connection with the Royal Naval Reserve, it may be appropriate to glance at the training and education of the officers of the mercantile marine. The subject has of late excited much interest in foreign countries. A circular was addressed by the French Government last year to the Presidents of the Chambers of Commerce in the several ports, proposing the creation of training establishments for the merchant service. In the United States the work has been taken in hand in a practical form by the passing of an Act by Congress authorising the Navy Department to hand over a vessel of war to the cities of San Francisco, Philadelphia, Baltimore, New York, and Boston. These vessels will be supplied on the demand of the governors of the respective states. Officers will be appointed by the Navy Department. The ships must not be used as reformatories, and are to be returned to the Navy if required. The city of Philadelphia has already availed itself of the privilege thus conceded. The Saratoga was handed over by the naval authorities, fitted out as

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a school-ship, and sent to sea with 110 boys for training. The first voyage, to the Azores, Southampton, and Madeira, was in all respects successful.

In France. In France, as might be expected, dependence is placed on the direct assistance of the State in carrying out any scheme of training for the mercantile marine. The training for the Navy embraces a course on the stationary school-ship, the Borda, to which is attached the sailing-tender Janus and the steam-tender Allier. On leaving the Borda the cadets join the frigate Iphigénie, for a cruise extending over a year in the North Atlantic. It is admitted that the training for the French Navy is too elaborate and costly for the merchant service. It has been proposed that four special training establishments should be set up, one being in the Mediterranean.

System inaugurated by compiler. The compiler notes with satisfaction that the system which he has inaugurated on board the British sailing-ships Harbinger and Hesperus, in the Australian trade, is considered worthy of imitation in France, and that the great steam-ship companies are being strongly urged to fit out sailing-ships, to which cadets could be appointed for a practical training in seamanship, as a preliminary to service in vessels dependent on steam power.

Liverpool Journal of Commerce. The establishment of a college for the education of the mercantile marine has been advocated in the columns of the *Liverpool Journal of Commerce*. The regulations for admission to the Royal Naval College at Greenwich provide for the entry of students from the merchant service. Hitherto the number of those availing themselves of this privilege has been small. Before deciding on the creation of another special institution, it would be necessary to be satisfied that it was impracticable to extend more freely the resources and advantages of Greenwich.

Manning of steam branch of Navy. It is chiefly in the steam branch that the manning of the Navy presents difficulties which have not as yet been completely overcome. A perfect system has long been established for the raising and training of blue-jackets. A sudden change has recently taken place. Masts and yards are now considered an encumbrance. We have become dependent wholly on machinery for the motive power, and we have not yet been completely successful in adapting the *personnel* of the Navy to the new conditions.

Training of engineers. And first as to the training of the engineers of the Royal Navy. In theoretical instruction they are as a body far ahead of their brethren of the merchant service. The training, as now carried out, was suggested by a Committee presided over by the late Sir Cooper Key, and was intended to combine a scientific course at the Royal

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Naval College with a thorough practical training in engineering workshops in the dockyards. There is reason to doubt whether we have succeeded in giving to the naval engineers that form of professional experience, which is sought for and obtained by the owners of steamers, in which such marvellous feats are performed in making passages in all weather, at the highest speed, across the Atlantic. From the nature of the service it is difficult to gain all the experience required by the naval engineer in the engine-rooms of Her Majesty's ships. It would seem desirable to make arrangements with the great companies for sending the young engineers of the Royal Navy for a limited period as supernumeraries in such ships as the Teutonic and the Etruria.

United States.

Our experiences are those of every naval administration in the present day. Engineer-in-chief Melville, of the United States Navy, in his last annual report, insists both on the insufficiency of numbers and the imperfect training of the engineer corps under his supervision.

Complaints of insufficiency of numbers of engineers.

It is greatly to be regretted that the engineers of the Royal Navy are not fully contented with their position. The state of the Navy list is thus described in the *Engineer* of the 19th December, 1890:—

"Although much attention was directed to the condition of the engineering branch of the Navy last year, the Naval Estimates for 1890–91 show that the grievances complained of instead of being remedied will be considerably increased. The number of ships and torpedo boats is to be largely increased, the engine-room complements raised to 10,671, and their proportion to the seamen and boys to 47½ per cent. Instead of an increase of from forty to fifty engineers, the numbers are decreased from 727 to 717, the numbers for the service of a largely increased fleet from 642 to 639, and 186 engine-room artificers substituted in their place. No increase will take place until 1894. As there will be considerable difficulty in obtaining and retaining the engine-room artificers, and as several of the vessels to be added to the Navy will be first-class war vessels, with an average complement of six engineers each, the only result must be the withdrawal of those officers from the insufficient complements of smaller vessels. The number of chief inspectors and inspectors of machinery, fleet, staff, and chief engineers, remains unaltered at twelve and 250 respectively; engineers are to be increased from 206 to 256; assistant-engineers reduced from 253 to 199. According to the latest Navy list, the number of engineers was 263, or seven more than the estimated quota, but this number included several who had not served as assistant-engineers the

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necessary time for promotion—five years. The list of assistant-engineers does not contain a single name who will be qualified for promotion before July, 1891, and is reduced, including eleven at Greenwich Naval College, to the small number of 179, or twenty below that estimated. The diminution in number continues, the deficiency of seventeen on an establishment of 721 at the end of 1889 by the end of June became a deficiency of twenty-nine on an establishment of 717, and although there were about thirty additional assistant-engineers appointed in July, by the end of November the deficiency again reached seventeen."

Grievances of engineers.

The grievances of the engineers and the remedies proposed by them have been embodied in a recent pamphlet, of which the following analysis was published in the *United Service Gazette*:—

United Service Gazette.

"The engineers submit that the relative rank of 'with but after' may be abolished in all cases, and that they may be granted rates of pay and relative rank as follows:—

"Assistant-engineer on entry, full pay 7*s.* 6*d.*, rank sub-lieutenant, after one year's confirmed time to receive 9*s.* per day. Engineer on promotion to rank with lieutenant, with 10*s.* per day, after four years' service 12*s.*, and eight years' service 14*s.* per day. The present title of 'Chief Engineer' to be abolished. Staff engineers on promotion, and whilst holding that grade, to rank with lieutenant of eight years' seniority; the pay to commence at 16*s.* per day and rise to 24*s.* after six years' service. Fleet engineers to rank with commander, and providing they have eight years' senior service their pay to be 27*s.* per day, rising to 33*s.* per day after twelve years' senior service. The titles of 'Inspector' and 'Chief Inspector of Machinery' to be altered to Deputy Inspector and Inspector of Naval Engineering respectively, and that the full pay per day of the Deputy Inspector be 40*s.*, with the relative rank of captain. The full pay per day of the Inspector of Naval Engineering to be 50*s.*, with the same relative rank of captain; both according to date of first commission as Deputy Inspector of Naval Engineering. The rates of pay asked for do not exceed those granted to naval medical officers of similar length of service, and the relative rank desired is inferior to that of the medical officers. Also the engineer-in-chief should be placed at the head of and senior to all naval engineer officers as 'Director of Naval Engineering,' that he have relative naval rank with a rear-admiral, the same as that of Inspector-Generals of Hospitals and Fleets, and that his salary be increased to at least £2,000 per annum, the same as that paid to the Director of Naval Construction."

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The engineers should be treated liberally.

Making every allowance for the advantages the engineers enjoy in receiving an excellent professional education at the public expense, it will be an obvious duty of the Admiralty to review in a liberal spirit the rates of pay and the relative ranks of the engineers. Their increased responsibilities have not as yet been fully recognised. The same observation is applicable in the case of the Naval Reserve. We have no sufficient reserve of engineers, and we cannot induce the men we want to enter into a contingent engagement to serve unless we are prepared to offer an adequate retainer. The suggestion that, as a first step, an engineer should be appointed to the Board of Admiralty would be a bold innovation, but one not uncalled for in the new order of things with which we have to deal, in the manning of a steam-propelled Navy.

Artificers and engineers.

The duties of the artificers of the Royal Navy are almost identical with those of the engineers in the mercantile marine. Their position demands careful consideration. Artificers are now charged with responsible duties formerly entrusted to engineers. Comparing the Trafalgar and the Teutonic, the *Engineer* of August 22nd, 1890, points out that the duties are carried out on quite different systems on board the two ships.

Systems on Teutonic and Trafalgar compared.

"The Teutonic carries eighteen engineers and a chief engineer. There is besides a small army of greasers. The Trafalgar will carry a chief engineer, and three assistant-engineers, and twelve engine-room artificers. These artificers are fitters, erectors, coppersmiths, &c., and in no way on a par with the engineers of the Teutonic, who nearly all hold first-class certificates from the Board of Trade. They have all had sea experience, and they are accustomed to the continual use of engines of the largest size driven as hard as they can go. We believe that it would be very much better for the Navy if more men of the Atlantic liner type were employed in it, but this would cost more than the present system. It is doubtful, however, if it would be dearer in the long run, if we bear in mind the frightful cost in mere money of the incessant breakdowns for which our war-ships are notorious. It is quite an open question if the best results can be obtained from the employment of one or two highly-trained men and a great many fitters and erectors. It appears that in this respect the practice of the great steamship companies is much to be preferred. In the Navy there is too great a gap between the engineers and the artificers. An intermediate class is wanted, and could be provided at a moderate outlay."

Stokers.

Chief Engineer Langmaid.

The training of naval stokers formed the subject of a paper by Chief Engineer Langmaid, recently read at the Royal United Service

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Institution. The paper opens with the following extracts from Admiral Baird's report on the Manœuvres of 1889:—

"I cannot urge too strongly upon their Lordships' consideration the inadequacy of the engine-room complements of modern ships and cruisers; not only does this apply to the number of ratings authorised, but to the fact that so large a proportion of the crews comprise stokers, 2nd class, and a large number of the stokers are men who have been advanced to that rating for drafting purposes while still untrained."

Defective physique.

"I had been led to believe that there was a proper standard as regards height and chest measurement for stokers; but, judging by their physique generally, it would appear that such is not the case. The men are willing enough, and do their best, but are quite incapable of undergoing the labour required, nor, in fact, can it be exacted of them, since they become exhausted and faint."

"Captains, without exception, have spoken to me on this subject; and represented it as actual cruelty putting these men to work at the fires, as they have been forced to do when chasing or being chased."

"This is a grave matter, and demands immediate action, as in wartime it will not be practicable to supplement the stokers with deck hands, especially in modern ships, with complements cut down to the lowest possible scale; nor, when sent down, are they of any use but to trim coal, and relieve the firemen of that laborious work."

Report of Umpires on Manœuvres, 1888.

In the report of Admirals Sir W. Dowell, Sir R. V. Hamilton, and Sir F. Richards, on the Naval Manœuvres of 1888, the following paragraph occurs:—

Employment of deck hands.

"We would call attention to the fact of the large number of deck hands employed in the stokeholds of many of the ships engaged in the late manœuvres, which would point to a deficiency, either in the complement, the quality of the stoker, or to inexperience; and from what came under our own personal observation as Commanders-in-Chief on foreign stations, when ships were recommissioned abroad, we are inclined to attribute it to inexperience, as there was no doubt as to the great improvement in the stoking after a few months' practice."

Importance of duties of engineer staff.

The question thus dealt with is one of the utmost gravity for the Navy, and as such cannot be passed by lightly. To use the words of the Engineer-in-Chief of the United States Navy in his last report:—

"In the naval battle of the future the engineer staff will have a difficult and important part to perform, and if there is failure in the engine room, no amount of skill and bravery on the bridge may suffice to avert disaster. Celerity of movement has decided many a

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naval battle, and will decide many more, and the celerity of movement of a modern ship depends directly on the skill of her engineer officers."

Numbers required.

The number of stokers now required for manning the Navy is 9,300. An attempt has been made to recruit in the manufacturing districts, but with wages at £2 10s. as against £4 for the mercantile marine, it is not reasonable to expect that trained men will offer themselves for enrolment as stokers in the Navy. With the present rates of pay the stokers required must be raised and trained in the service, at the rate of no less than 600 new entries annually. Mr. Langmaid proposes "that all newly entered men should be sent to a central training-ship, in the same way that Royal Marine recruits are sent to the depôt at Walmer, and be trained there for three months." . . . "The three months' course of instruction in the harbour training-ship should be followed by another three months' instruction in a sea-going ship."

Training.

In a letter to the *Times*, dated 11th October, 1888, the compiler made the following suggestion:—

Compiler's view.

"In the manning of the Navy, the blot which it is most urgently necessary to remove is the defective training of the stokehold and engine-room staff. The mobilisation puts numbers of young untrained artificers and stokers into the ships, and difficulties must be expected. We are making progress in the management of the machinery of torpedo-boats. We are training men to this work by keeping a few boats manned from the torpedo schools constantly under way. A vessel of the Archer class, and another of the Severn class, should be kept in commission at the home ports. All young engineers, artificers, and firemen should go through a course of instruction in these vessels in the management of engines at full speed. At Spezzia, an ironclad of the Italian Navy is daily under way for a similar purpose."

Mr. Langmaid's proposal.

Mr. Langmaid is of opinion that a vessel of the Apollo class would be suitable. He would propose to attach one of them to the harbour training-ship, to be always in commission, with a small permanent staff of officers and men, and to be used for the practical sea-going instruction and training of assistant-engineers, engine-room artificers, and stokers. During the three months the men were embarked in the cruiser, they would probably get as much actual full-power running as in a year or more of a commission in an ordinary sea-going ship.

Less costly to raise pay.

With the improved training suggested by Mr. Langmaid, the stokers entered from the shore for the Navy will be more efficient.

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Such training would, however, cost a considerable sum. It would probably prove a less costly solution of the difficulty to raise the scale of pay in the Navy to the level of the wages of stokers outside the service. An ample supply of men is obtainable, provided that the terms which we offer compare favourably with the wages in private employ.

Stokers employed on deck.

Large as are the present numbers in the service, the engineers complain that the complements of stokers are not sufficient to maintain a full head of steam when the engines are pressed to the utmost on a long passage. They could not do the work which is daily performed on a merchant steamer. An order has been recently issued to add twenty-two stokers or stokers second-class, to the complement of the Aurora at Devonport, and a similar order has been received at Portsmouth in regard to the Galatea, which is not yet in commission. This addition is to be made, it seems, upon the distinct understanding that, except when the machinery is being driven at high speeds, there shall always be a deck-party of twenty stokers available for the duties which at present are performed by able or ordinary seamen.

Stokers should be drilled as combatants.

With increased numbers in the engine-room complements and proportionate reductions in the blue-jackets, it has become more than ever essential that the stokers should be drilled as combatants at the gun and the rifle.

Length of Commissions.

The compiler renews in the present volume of the *Annual* the expression of his confident opinion that foreign commissions should not be allowed to extend beyond a period, at the extreme, of two years and a half. The number of vessels permanently employed on the foreign stations should be reduced. Flying squadrons, visiting all the stations in succession would produce whatever moral influence may be gained by showing the flag. Service in a flying squadron would be far more valuable for the purposes of professional instruction than long commissions passed in ships permanently attached to the several stations abroad. It would be a boon to allow every ship to pass the last year of the commission in home waters.

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CHAPTER VIII.

Foreign Policy.

Relations with France.

In measuring our naval strength and resources we can never keep out of view the state of our foreign relations generally, and especially our relations with the French Republic. That the two nations have it in their power to inflict serious injury upon each other is beyond dispute. It would be easy for us to bombard the sea-board cities of France, and easy for the French to inflict reprisals on our trade and commerce. Happily there are no questions in dispute between the two powers which are not readily capable of solution by the exercise of mutual good-will. Our military occupation of Egypt is the most serious cause of difference. In the judgment of the compiler, the occupation, however beneficial to the people of Egypt, is a source of weakness to England. We may be doing a service beyond price in diffusing the blessings of civilisation; in improving administration and cheapening its cost; in holding a shield before the oppressed; and in insisting on honesty and purity in the courts of justice. In introducing these reforms we are loyally discharging our duty as the mandatories of Europe. Viewed, however, in its connection with the general problem of the defence of the empire and its communications, the continued occupation of Egypt must be regarded rather as a source of weakness than of strength. In maintaining an army of occupation, which, in the event of war in Europe, would probably require reinforcement, we are withdrawing men who can ill be spared from our small military force available for foreign service. So long as we command the Mediterranean we do not require an armed force in Egypt to prevent the occupation of that country by any hostile or rival power. Napoleon, at the head of a victorious army, was reduced to utter helplessness by the battle of the Nile. His communications being destroyed, he was compelled to seek for safety in a hazardous and humiliating flight.

Occupation of Egypt a source of weakness.

Captain Mahan.

Captain Mahan has laid down a golden rule. "States having a good sea-board will find it to their advantage to seek prosperity in commerce rather than in attempts to interfere with the political arrangements of other countries." In one of his conversations with

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O'Meara at St. Helena, Napoleon said truly, "You are superior in maritime force to all the world united, and while you confine yourself to that arm you will always be dreaded." Napoleon.

By the evacuation of Egypt the present state of tension in our diplomatic relations with France would be relieved. All the difficulties which have arisen on matters in which the colonies are directly interested, whether in relation to the New Hebrides, the penal settlement of New Caledonia, or the French rights of fishery on the coast of Newfoundland, would be removed by the withdrawal of the British regiments from Egypt. Such a step would not weaken us. Rather, it would strengthen the forces at our disposal for the defence of the real interests of the empire. It cannot be repeated too often or too emphatically that the defence of the empire embraces and is limited to the defence of the mother-country, its colonies, and India, from invasion, and the maintenance in security of our ocean routes. The defence of the empire in this limited but adequate sense should be assured against every conceivable combination. All commitments and engagements, not essential to the protection of vital interests, are a source of weakness in war, and tend to provoke bitterness and jealousy in peace. Advantages of evacuation of Egypt.

And here it may not be inappropriate to remark that the cultivation of more cordial relations with Russia would be the best policy for the maintenance of our power in India. There is reason to believe that such a policy would be cordially reciprocated. A French writer of authority expresses his conviction that the military and the national sentiment in Russia is faithfully represented in a passage which he quotes from a letter written by Skobeleff, in August, 1881:— Relations with Russia.

"Aussi longtemps que la question polonaise et celle de la Russie occidentale ne seront pas résolues, la Russie ne pourra songer à aucun développement réel, dans le sens naturel et historique de ce mot. A l'heure présente, toutes nos frontières sont ouvertes devant une invasion étrangère, et cette situation nous oblige à entretenir une très nombreuse armée. La question polonaise, surtout, nous tient dans une position très critique, et, jamais autant que maintenant, à cause de l'alliance austro-allemande. Skobeleff.

"Une guerre dans les Balkans ne peut s'accomplir sans une démonstration sérieuse du côté des Indes. Au cas où l'Autriche serait trop exigeante dans ses prétentions, et réclamerait la possession de Salonique, la Russie arriverait peut-être à une alliance avec l'Angleterre. Mais il lui faudrait alors, absolument, avoir en Asie une forte armée, prête à marcher, et pouvant devenir pour l'Angle-

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terre un péril si les Anglais refusaient de tenir leurs engagements. On pourrait d'ailleurs sacrifier à l'Angleterre toute l'Asie centrale, si l'on arrivait avec elle à une alliance sincère et sérieuse."

Newfoundland question.

The negotiations now in progress in reference to the rights enjoyed by France, under treaty, in Newfoundland cannot be passed by without notice in a retrospect of the year 1890 from a naval point of view. By the Treaty of Utrecht, in 1713, there were reserved to France rights over a portion of the West Coast of Newfoundland, known as the French shore. These rights, confirmed by all the Treaties of the eighteenth century, and by those of 1814 and 1815, are of no practical value to France. It was stated by the Newfoundland representatives that during the fishing season only seven French vessels frequent their coasts. That the rights are useless in themselves is admitted by eminent writers in the French press. The substance of an article, published in the *Economiste Française*, by M. Léroy-Beaulieu, is summarised as follows in the English *Economist* of January 17th, of the present year :—

M. Léroy-Beaulieu's view.

"M. Léroy-Beaulieu returns to the question of Newfoundland, to show the necessity for a compromise, by the surrender of the treaty-rights of France to the French shore in exchange for the abandonment by England of her treaty of commerce with Tunis, which forms an obstacle to the assimilation of the Regency to Algeria as a French colony. Unlike the majority of his countrymen, he does not consider that the dignity of France requires her to defend rights of little value in themselves, and regardless of consequences. He even admits that however legitimate those rights may be from an historical standpoint, they are contrary to modern international law. The Treaty of Utrecht dates back 177 years ; a coast which was a desert less than a century ago has now a population of 200,000 of British origin, while all traces of the French race have disappeared, and all that remains is the servitudes established by treaty. These consist, not only of the exclusive right to fish along the French shore and erect buildings on the land, but also that of the *première chance*, according to which the Newfoundlanders must wait until the French have taken up their nets before laying down their own. The Treaty of Utrecht has been already violated, M. Léroy-Beaulieu adds, as, contrary to the clause that prohibits any permanent establishments on the French shore, more than 12,000 English colonists are settled and reside there, and the more that population increases the more odious those servitudes appear to them. He foresees that the outcome of a prolongation of the present situation would be either the Newfoundlanders voting their annexation to the United States, or a declaration by

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England that she refuses to be bound any longer by the Treaty of Utrecht. Annexation to the United States would, he believes, be a misfortune not only for England, but for France also, as it would be a prelude to the annexation of Canada, and France has the greatest interest in Canada not forming part of the Union. The French element, which preserves with such tenacity the language, the name, and love of France, would be very soon absorbed, and gradually disappear, if Canada were transformed into one or two States of the great Federation. To show the little importance of the French shore to France, he states, on the authority of the Colonial Statistics, that of 504 ships which arrived from the fisheries in 1888 at the French islands of St. Pierre and Miquelon, only 22 came from Newfoundland, and only four from the West Coast, the disputed territory, and of 589 which left the same islands for the fisheries, only two were bound to the French shore. Another reason for not desiring the annexation of Newfoundland to the United States not mentioned by M. Léroy-Beaulieu, but which was probably in his mind, was that it would have the consequence of causing France to lose the monopoly of the exports of cod-fish to Spain and Italy, which amounted to 11,000 tons in 1889, and has been considerably more. That monopoly has been obtained by bounties representing 30 per cent. of the value of the fish, and against which the Newfoundlanders are unable to compete. It can scarcely be doubted that in the present rage for protection in the United States, if Newfoundland belonged to the Union the Americans would oppose the French bounties by higher bounties."

M. Weyl's opinion.

Writing from a naval point of view, M. Weyl, in an article published on the 17th January last, urges the desirability of putting an end to a discussion which may be the cause of serious trouble both to the French and British Governments. In the interests of the French Navy, the only fishery which is of consequence as a nursery for seamen is that on the great banks of Newfoundland. The fishery on the shores of that island is not a training-ground for seamen. Supply of bait is all that the French really need; and, if this matter were approached in a reasonable spirit, M. Weyl is of opinion that the other rights now held by the French under Treaty should be abandoned.

Bait question.

The people of Newfoundland, being entirely dependent on the produce of their fisheries, are naturally irritated by the competition of the French fishermen, stimulated as they are by bounties on export to foreign countries, amounting altogether to some 72 per cent. of the first value of the article. In the conviction that the increase in the

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French production of salt fish would be impossible without a supply of the bait obtained from their territorial waters, they determined on withholding it by a legislative enactment.

The possessions on Gambia and Sierra Leone might be given up.

It has been suggested that the French might be induced to surrender their Treaty rights in exchange for the British possession of the Gambia. It is possible that they would attach serious value to the Gambia if combined with the possession of Sierra Leone. From the point of view of Imperial defence, Sierra Leone appears to the compiler to be of little value. It is impossible to maintain a strong British garrison at a station so unhealthy, without a loss of life frightful to contemplate. As a coaling-station, Sierra Leone cannot be regarded as indispensable. The means of coaling our cruisers can always be improvised by sending colliers to a rendezvous under the lee of an island of the Cape de Verde group. With our naval supremacy intact, it were supine indeed to permit Sierra Leone to be used as a base for hostile cruisers. It would be the first operation of a naval war to despatch a force to Sierra Leone. The garrison would be quickly driven from their guns by the crushing fire of an ironclad fleet. Any stores of coal which might have been accumulated would be destroyed. It is needless to add that colliers sent out with further supplies would be intercepted on their passage.

Sierra Leone of little value.

Cruisers could be coaled at sea.

Protection of commerce would be greatly facilitated if our cruisers could be coaled at sea. The possibility of coaling at sea in the fine weather latitudes was demonstrated in the recent manœuvres, when, in favourable conditions of weather, the ships were able to take in coal at the rate usual when in harbour. Coaling from colliers suitably fitted would be rarely impracticable under the lee of the Cape de Verdes.

The adoption of the mid-ocean route to the Cape, as recommended by Captain Cleveland, would make Sierra Leone of little value as a coaling-station.

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CHAPTER IX.

Coaling Stations.

In dealing with the coaling stations, it must be our guiding principle that we depend for the defence of the British Empire on our naval supremacy. That supremacy secured, the local defences need not be our first care. If the naval supremacy be lost, no local defences can be effectual to prevent the capture of the coaling stations by a powerful fleet. Raids on undefended places, such as were made during the recent naval manœuvres, are not likely to occur. The power of reprisal is always in the hands of the stronger combatant, and the fear of retribution will be an effectual check.

Defence of coaling stations depends on Navy.

Sound policy demands that the naval bases to be defended by works and held by adequate garrisons should be as few as possible. The points selected should be made practically impregnable to such force as could be sent against them.

For the route to the East we must hold the Cape, Mauritius, Aden, Singapore, Hong Kong, Torres Straits, and King George's Sound. Neither St. Helena nor Ascension can be regarded as of first-rate importance, though we could not allow them to fall into other hands. The former has been greatly strengthened. At Aden, it has been decided to improve the defences and to reinforce the garrison. A naval base is necessary in the West Indies, and Jamaica and St. Lucia are being more strongly fortified. Gibraltar, which in the last century was regarded by Pitt and by George III. as of secondary importance, and Malta, which Lord Nelson always considered as of little value in comparison with Port Mahon, are important in the present day less as coaling stations for the defence of trade routes than as bases of operations for maintaining our naval supremacy in the Mediterranean.

Stations to be defended.

Passing from the political and strategical importance of the coaling stations to the state of their defences and armaments, a satisfactory statement to the House of Commons was made during the present session by Mr. Stanhope.

State of defences.

The armament has now gone out to Singapore, Hong Kong, Table Bay, Simon's Bay, Colombo, Jamaica, St. Lucia, and Sierra Leone;

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and the last guns for Aden and Mauritius are now awaiting shipment. The armament is also ready for Esquimalt, for King George's Sound, and for Torres Straits; but in none of these three places have the Colonial Governments yet undertaken the preparation of the necessary works for mounting the guns when sent out. The task of adding modern guns to the armament of our great fortresses at home and abroad is also nearly complete. Whereas three years ago no modern guns were effectively mounted in any one of our fortresses or coaling stations, except the four big guns at Malta and Gibraltar, now a powerful modern armament has in all cases added largely to their security. Amongst the places so strengthened are Portsmouth, Plymouth, the Thames, Malta, and Gibraltar.

Garrisons incomplete.

There is reason to fear that the arrangements for providing garrisons for the coaling stations still leave much to be desired. It has been recently stated by Lord George Hamilton that the full strength of the garrisons of all the coaling stations abroad in time of war, including Gibraltar and Malta, would be 35,000 men, who would need a reserve of 15,000 at home. If this be the force required, it is certain that it has not yet been called into existence.

Local forces should be organised from native races.

It is not possible to maintain large garrisons of British troops permanently at unhealthy stations. At such places as Sierra Leone, Mauritius, and Singapore, it is necessary to have a force recruited from the tropical races as a support to the British troops. The artillery at home should be strengthened, with a view to the instant despatch of reinforcements to the coaling stations whenever required. At Singapore a magnificent force of Sikh police, more than 1000 strong, is maintained. It is to the police that we must look to assist in manning the works in case of attack, and the force should be strengthened. For Mauritius a local artillery might be raised among the native races at the Cape. At St. Helena the civil population could largely assist the artillery sent from home in manning the works. In the West Indies the Government has suggested that volunteers should be raised; and although this most reasonable appeal has been denounced in the press, when better understood, it should meet with a loyal response from those concerned.

Proposal to place coaling stations under naval control.

A proposal that the coaling stations and the ports held for naval purposes should be under naval and not under military control has recently been brought forward in Parliament, and supported out of doors by the able advocacy of Sir William Drummond Jervis. The report of Lord Hartington's Commission has been claimed in its support. The Commission reported strongly on the necessity for a

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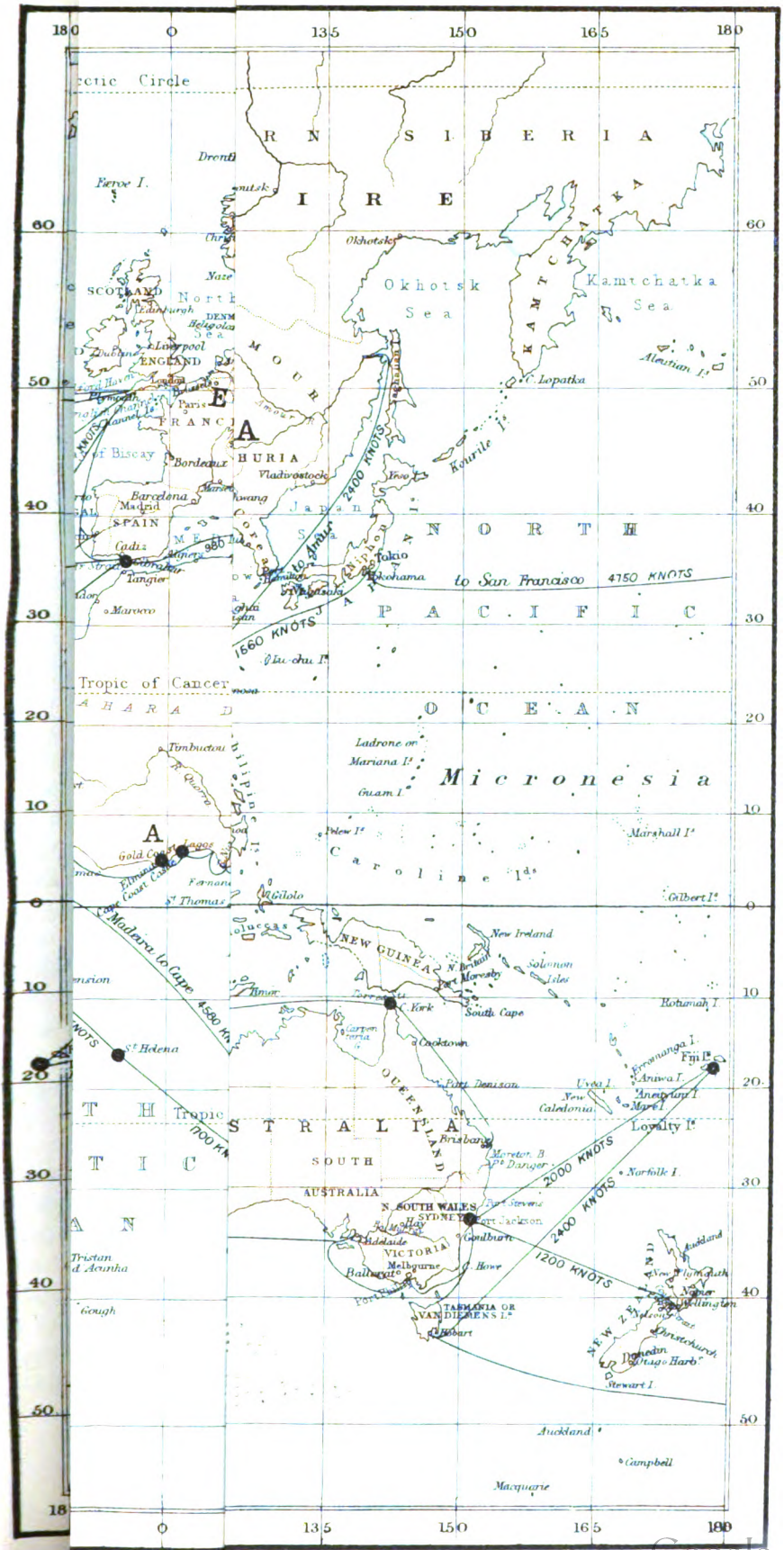

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combined plan for the defence of the Empire by the naval and military forces. Such a plan had never been worked out or decided upon; some most vital questions had been left in a dangerously uncertain condition. The proposal to increase the responsibilities of the Navy for local defence has hitherto found no prominent advocates in the Service. Apprehension naturally arises of ill-consequences from any wide extension of the opportunities of service on shore. Service at sea imposes many sacrifices and privations, and in time of peace there are no opportunities of gaining distinction by brilliant feats of arms. It is common experience that there is more chance of rapid promotion in the junior ranks by devotion to the specialities of gunnery and torpedoes, and in the schools of training, than by going to sea. Hence it is that, except during the short period of the manœuvres, peace service at sea offers few attractions. If the Navy undertakes the defence of the ports and the coaling stations, the number of agreeable billets on shore will be greater than at present, and sea-going appointments will be still less sought after than they are now.

Objections to from service.

From an administrative point of view the increase of responsibility may reasonably be viewed with apprehension. The First Sea Lord is already heavily weighted with difficult and multifarious duties. As a seaman he might be reluctant to undertake the work of a soldier in the supervision of the defences of the ports and coaling stations, while he would probably be reluctant to delegate his responsibilities to another department working independently under the Board of Admiralty.

In his able statement to the House of Commons, Lord George Hamilton urged as an objection to the proposed change that the Navy was bound to consider itself the first line of defence for the empire and its commerce. To take the offensive would probably be in any case the best method of action, and the Navy would be tempted to regard the local defences of the ports and coaling stations as a secondary and subordinate duty. A Government which did not aim at maintaining supremacy might take a different view, and in contemplation of the withdrawal of the naval force from the open sea it might consistently be held that the responsibility for the defence of the ports should be limited to the Navy. Lord George Hamilton insisted that the transfer of responsibility would involve a serious addition to expense, and this for a problematical advantage. Having stated his reasons against a sudden and wide change, he suggested that an experiment might be tried on a limited scale. The Falkland Islands were about to be made the head-quarters of a new

Lord George Hamilton's objections.

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naval station, including the West and East coasts of South America. The garrison was to consist of marines. If successful in this case similar arrangements might be adopted for Hong Kong.

The marines might be utilised.

Lord George Hamilton considered that the failure, under the existing system, to get for the country the full benefit of the services of the magnificent force of marines was a strong argument for entrusting to that force the charge of some of the naval stations abroad. For the marine service an enlarged sphere of duty could not fail to operate as a stimulus and an encouragement. For the officers of the force no adequate career is at present open. As they rise in rank their range of duty rarely extends beyond the supervision of the internal economy of a battalion, and the formal movements of the barrack-yard. The charge of foreign stations would offer a wider career and attract men of superior ability to the marine service.

A careful consideration of the subject points to the conclusion that the Government are well-advised in feeling their way and testing a new system by experiment, before venturing on more ambitious schemes. The foreign officers, who have criticised with much severity our organisation for coast-defence, have hardly made sufficient allowance for the practical ability, which has so often enabled Englishmen to accomplish admirable work under an inferior system.

It cannot be doubted that the Government will keep in view the suggestion strongly pressed by Lord Hartington, that careful consideration should be given to the distribution of responsibilities as between the Navy and the Army for the defence of the Empire under all conceivable contingencies.

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CHAPTER X.

The Naval Defence Act.

Programme of ship-building.

It is proposed in the present chapter to review the general policy of construction for the Navy under the existing Board of Admiralty, and to consider how far the general preparations we are now making are adequate to our needs. The programme of ship-building under the Naval Defence Act of 1889, comprised thirty-eight ships to be built in the dockyards, and thirty-two to be built by contract. The former were estimated to cost £11,500,000, and were to be paid for by monies annually voted by Parliament. The expenditure on the thirty-two ships to be built by contract was to be defrayed by a fund of £10,000,000 placed at the disposal of the Admiralty by Act of Parliament. No part of this sum is borne on the votes submitted for the approval of the House of Commons in the Navy Estimates.

The seventy vessels laid down under the Naval Defence Act include—

8 First-Class Battle-Ships.
2 Second-Class „
9 First-Class Protected Cruisers.
29 Second-Class „
4 Third-Class „ (Pallas type).
18 First-Class Torpedo Gunboats.

Contract-built ships.

Such being the proposal of the Admiralty in 1889, let us see with what measure of success they have been carried out. The official report is contained in Lord George Hamilton's statement explanatory of the Navy Estimates for 1891–92.

Second-class cruisers.

"Of the seventeen second-class cruisers building by contract eight have been launched, and one, the Latona, has been delivered at Portsmouth, where she is now completing for sea. It is anticipated that all the vessels of this class will be delivered before April 1892.

First-class cruisers.

The five first-class cruisers building by contract will be launched during the year 1891–92.

Battle-ships.

"Three of the four first-class battle-ships building by contract are now considerably advanced. The fourth is in an earlier stage of

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construction. The deliveries of armour for all the battle-ships, both building in the dockyards and by contract, have been on the whole satisfactorily carried out. The manufacture of such large quantities of armour in so limited a period was a difficulty which required very careful consideration and pre-arrangement. The contracts made have been on the basis of the prices paid in 1886 for the armour of the Trafalgar and Nile.

Gunboats. "Six vessels of the torpedo gunboat type will shortly be put out to contract. As they are of small dimensions, their construction and completion will not occupy more than eighteen months.

Dockyard-built ships. "All the ships that were ordered and commenced in the dockyards before 1889–90, will, with the exception of Blake, be practically completed in the financial year 1890–91.

Progress made. "The number of ships of all classes building or to be built in the dockyards under the Naval Defence Act of 1889, by the 31st March, 1894, was thirty-eight, and they comprise four first-class battle-ships, two second-class battle-ships, four first-class cruisers, twelve second-class cruisers of the Apollo and Astræa classes, four second-class cruisers of the Pandora class, and twelve torpedo gunboats. Twenty-eight of these vessels are in hand, and are being advanced with great rapidity. Of the remaining ten, five second-class cruisers of the Apollo class will be commenced during the financial year 1891–92, and five torpedo gunboats will be laid down in the financial year 1892–93.

Battle-ships. "The first of the four first-class battle-ships, the Royal Sovereign, completing at Portsmouth, was launched on the 26th February, 1891; the second, the Renown, building at Pembroke, in May, 1891; and the third, the Hood, at Chatham, will be ready for launching very shortly. The Royal Sovereign was laid down in the month of September, 1889, and the work upon her and the other vessels of her class has been performed with unprecedented quickness and economy.

"The two second-class battle-ships have just been commenced.

First-class cruisers. "The first of the four first-class cruisers, the Edgar, was launched at Devonport in November, 1890; the second, the Royal Arthur, was launched at Portsmouth on the 26th February, 1891; and the third, the Hawke, is nearly ready for launching at Chatham.

Second-class cruisers. "One of the second-class cruisers was launched in August, 1890, and the second was launched on the 10th February, 1891. Three of the second-class cruisers of the Pandora class are already afloat. Two of the torpedo gunboats, the Gossamer and Gleaner, have been launched, and are nearly complete. The machinery of

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these two vessels has been made in the dockyard, and the Gossamer has passed her steam trials with great success. She will be completed ready for commission during the present financial year."

Probable date of completion.

Summing up the progress made in the dockyards and by contract, Lord George Hamilton says:—"The work contemplated by the Naval Defence Act is now sufficiently advanced to enable a reliable forecast to be made both of the date at which it will be completed, as well as of its actual as compared with its estimatad cost. The number of ships to be built was seventy, of an estimated displacement of 316,000 tons, and carrying 540 guns, exclusive of machine guns and guns of small calibre. The whole of these vessels with their armament and equipment were to be completed and ready for commission before the 1st April, 1894. With the single exception of one contract-built ship, whose progress has been slow, there is every reason to believe, upon our present data, that the remaining sixty-nine will, with their armament and reserve guns, be finished before the date named."

In addition to the ship-building under the Naval Defence Act, the dockyards have been busily engaged during the last two years in completing ships, laid down previous to the adoption by Parliament of the Hamilton programme.

Old programme.

During the last three years the following vessels laid down under the old programme have been completed and passed into the First Reserve:—

	First-class Battle-ships.	Protected Ships.	Unprotected Ships.
1889–90	Trafalgar, Victoria, Camperdown .	3 3rd-class cruisers, Magicienne type.	2 sloops, Basilisk and Beagle, 1170 tons; 5 1st-class gunboats, 805 tons; 3 torpedo gunboats, sharpshooters, 735 tons; 1 training brig.
1890–91	Sanspareil . . .	2 Barham type, 1830 tons; 4 Blanche type, 1580 tons.	4 1st-class gunboats, 805 tons; 6 torpedo gunboats, sharpshooters, 735 tons.
1891–92	Nile	Vulcan, torpedo depôt-ship; Blake and Blenheim, 1st-class cruisers, 9000 tons; Bellona, 1830 tons.	

Additions to Navy 1891–92.

In addition to these vessels of the old programme, 18 second-class cruisers, Apollo type, 3400 tons, and 4 third-class cruisers, Pallas

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type, 2575 tons, laid down under the new programme, are estimated to be passed into the First Reserve in the ensuing financial year 1891–92.

Qualities of types.

Having given a general sketch of the shipbuilding work on which the Admiralty have been engaged, we may briefly consider the qualities of the several types under construction.

Battle-ships. First-class.

The first-class battle-ships were intended to possess in the highest practical development both offensive and defensive power. Their main armament consists of four heavy guns mounted in two protected stations, at a considerable distance apart. The auxiliary armament is distributed as widely as possible, partly in a long central battery, situated between the two heavy gun stations, and partly on a spar-deck.

In determining the length of the armour belt, a middle course has been taken between the French system of complete protection and the short belts of the Admiral class. In the Royal Sovereign, the protection consists of a belt at the water-line, 8½ ft. broad, extending over two-thirds of the length of the ship, and having a maximum thickness of 18 in.

Second-class.

While the new first-class battle-ship offers a powerful and impressive combination of all the elements of fighting efficiency, the size and cost constitute a serious objection to the type. It is satisfactory to know that a design for a second-class battle-ship has recently been approved by the Admiralty, in which the displacement and the cost show a marked reduction on the larger ships first laid down. The leading particulars of this new type, given in Lord George Hamilton's memorandum accompanying the Navy Estimates for 1891-92, will be found in Chapter XII. at p. 122.

First-class protected cruisers.

The first-class protected cruisers, of which the Royal Arthur, launched by Her Majesty at Portsmouth in February, 1891, is a specimen, are described in Lord George Hamilton's memorandum accompanying the Navy Estimates for 1889–90. This type presents a noble appearance in the water, and in point of seaworthiness would seem to leave nothing to be desired.

Second-class cruisers. Apollo class.

The second-class cruisers are of two types. The Apollo class, of which 21 are now being built in the dockyards and by contract, is of 3400 to 3600 tons displacement. These vessels are a great improvement on their predecessors; but our constructors have not been content with the success already attained.

Astræa class.

In his memorandum accompanying the Navy Estimates for 1891–92, Lord George Hamilton states that the experience gained during the manœuvres has led the Admiralty to modify the designs for the second-class cruisers remaining to be built.

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Improvements over Apollo class.

The thickness of the protective deck, and the protection to the machinery, as well as the coal supply, are identical with the Apollo class. The eight vessels to be built from the improved design, and known as the Astræa class, are to be wood-sheathed and coppered. As compared with the Apollo class, the essential difference is high freeboard throughout the length, and a flush upper-deck, instead of a poop, forecastle, and waist.

Two 4·7-in. guns have been added to the broadside armament, the whole of which is carried on the upper deck in the Astræa class at about eight feet greater height above water than in the Apollo class. The length is increased by twenty feet and the displacement to 4360 tons. This increase in dimensions, combined with higher freeboard, will greatly facilitate the continuous maintenance of a high rate of speed in a seaway.

Third-class cruisers.

In the third-class cruisers the improvements are not less marked than in the larger types; and corresponding increases in dimensions have been accepted.

Torpedo gunboats.

The torpedo gunboats are chiefly remarkable for their combination of high speed with seagoing qualities, such as will enable them to cruise with a fleet. The Alarm and her consorts are an improvement on the Sharpshooter. In the new vessels the displacement has been increased to 810 tons.

Summary.

Taking a broad view of the construction now in progress, it may be confidently affirmed that it presents the best types which, in the existing state of the science of naval architecture, can be designed within the prescribed limits of tonnage. In the cruisers, ingenuity has been strained to excess in the attempt to give extreme speed and a formidable armament. The cruisers of the future will be of large dimensions, and more weight will be allowed for boilers and machinery.

Shipbuilding abroad. France. Battleships.

Having described the construction in progress in Great Britain, let us turn to the shipbuilding of foreign Powers. For the French Navy, ten ironclads are in hand. The Neptune, 10,600 tons, commenced in 1882, will be ready for steam trials in 1891. The Brennus, 11,000 tons, commenced 1887, will be completed, it is hoped, in 1893. The Tréhouart, Furieux type, has been recently laid down. The Magenta, sister-ship to Neptune, commenced at Toulon 1883, is advanced to $\frac{80}{100}$ths. Three ironclads—Bouvines, Jemmapes, Valmy—each of 6700 tons, building by contract, are to be advanced to $\frac{38}{100}$ths in the present year.

Armoured cruisers.

In the class of armoured cruisers the Dupuy de Lôme, 6300 tons, laid down at Brest, July 1886, is to be completed 1892. The Charner

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and Bruix, 4745 tons, are building at Rochefort. The sister-ships Latouche-Tréville and Chanzy are building by contract, the former at Havre, and the latter at Bordeaux.

Armoured gunboats. Two armoured gunboats, first-class, 1640 tons, are in hand. The Phlégéton, commenced 1885, will be completed 1892. The Styx, commenced 1889, will be advanced to $\frac{68}{100}$ths in 1891.

Cruisers. Passing to the cruisers, the Alger, 4120 tons, commenced in 1887, will be completed in 1891. The sister-ship Isly, commenced at Brest, August 1887, will be advanced to $\frac{70}{100}$ths in 1891. Of the third-class cruisers, the Suchet, 3030 tons, commenced at Toulon, October 1887, will be advanced to $\frac{62}{100}$ths in 1891. The Bugeaud, Chasseloup-Laubat, and Friant, of the improved Suchet type, 3600 tons, will be laid down at Cherbourg, Brest, and Toulon.

Torpedo gunboats The torpedo-cruiser Wattignies, 1310 tons, building at Rochefort, commenced October 1889, will be completed in 1892. The sister-ship the Fleurus, is to be commenced at Cherbourg. The torpedo-sloops or gunboats, Lévrier and Leger, 450 tons, building at l'Orient, will be complete in 1891. Three similar vessels, the Catinat, Iberville, and Lavoisier, are to be built by contract.

Transports. The transport Manche will be completed at Cherbourg in 1891. No work is to be done on the transports Vancluse and Pacifique, or the sailing-frigate Andromède.

Seventeen sea-going torpedo-boats, 24 first-class boats, 56 second-class, will be in hand in 1891.

Germany. The following is a list of the ships in construction for the German Navy :—

Ironclads. Four ironclads of the first-class : displacement 10,000 tons, I.H.P. 14,000, speed 17 knots ; protection, 16-in. armour at the belt and 12-in. armour on the turrets. The heavy armament will consist of 44-ton guns, capable of piercing 30 in. of armour. The estimated cost is £480,000, and they are to be completed in 1894.

Two coast-defence ironclads : displacement 3500 tons, speed 16 knots.

Cruisers. In the cruisers class Germany is building two of 5000 to 5500 tons, one of 3600 tons, speed 20 knots, one of 1800 to 1900 tons, speed 18 to 19 knots. One of 1580 tons, one torpedo-sloop, 700 to 800 tons, speed 22 knots and two cruisers, to replace Adler and Ebber, 1800 tons.

The German Navy Estimates for 1890–91 amount to £4,440,000.

Italy. The Italian Government proposes to expend about £3,000,000 for additions to the Navy during its current financial year. Three principal types in the construction of new vessels have been adopted :

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(*a*) first-class battle-ships of about 14,000 tons, (*b*) second-class battle-ships of about 8000 tons, and (*c*) cruisers of 4000 tons. The greatest possible speed and gun-power is to be given to each class of vessels.

Battle-ships.

The following summary of vessels in construction is taken from *Le Yacht*:—"The Re Umberto, 13,090 tons, 18 knots, built at Castellamare, is to be completed in 1891. Five similar ironclads are in hand. The first of these, the Sicilia, was commenced at Venice in 1884, and will probably be finished in 1893. The Sardegna has been building at Spezzia since 1886, and should be completed in 1894. Three other ironclads of the same type are provided for in the Navy Estimates.

Cruisers.

Eight cruisers are in construction. The Umbria and Lombardia, 2300 tons, commenced 1888, are to be completed 1891. The Etruria and Liguria, of the same improved Dogali type, should be completed in 1892. The Marco Polo, 4460 tons, commenced at Castellamare in 1890, will be completed in 1893. Three vessels of the Etna type are to be put in hand. They have a displacement of 3530 tons, speed 17 knots, armament two 24-ton guns, and numerous quick-firers.

Torpedo-sloops.

Thirteen torpedo-sloops are in construction, including three not yet named, and the Minerva, Arethusa, and Urania, 846 tons, to be completed in 1891 and 1892. Eight vessels of the same type are to be commenced.

The building of seagoing torpedo-boats is being vigorously pushed forward.

Russia.

We now come to the Russian Navy. The following details are taken from the *Engineer*:—

"At the end of 1880, the Council of the Empire directed the Minister of Marine to submit a naval programme based on certain considerations, including the types of vessels most suitable for the country, the time and outlay required, and the means at the disposal of the Admiralty to carry it into effect.

Pro-gramme.

The programme submitted in the following year was an ambitious one. It stated that Russia required, in addition to existing vessels, nineteen first-class and four second-class ironclads, twenty-five cruisers of different dimensions, and a number of smaller craft. The amount of money required was estimated at 216,000,000 roubles, of which 102,000,000 roubles could be provided by the annual Estimates, and the remainder by an extraordinary Budget. It was thought that the programme might be completed in twenty years. It was stipulated that the hulls of all the ironclads and cruisers should be built in

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Russia. The programme was approved by the Emperor in 1882, and its execution commenced shortly after. By the progress already made we shall be able to judge as to the probability of completion in the time given.

Progress made—ironclads.

In 1883, three large ironclads—the Tchesmé, Sinope, and Ekaterina II.—were commenced in the Black Sea. They are of 10,150 tons and 13,000 horse-power, and they carry six 12-in. 50-ton guns in a pear-shaped barbette. The three Russian vessels are practically complete. In 1884 two ironclads of 8500 tons, the Alexander II. and Nicholas I., were commenced in the Baltic. The former was launched in 1887 and the latter in 1890. They are of the armoured cruiser type, having a complete belt of 14-in. armour. Two other ironclads are under construction in the Baltic and two in the Black Sea.

Cruisers.

It is in cruisers that Russia has shown the greatest progress and ability in construction. The Duke of Edinburgh was followed in 1880 by the Vladimir Monomakh, with a 6-in. belt and a speed of 15½ knots. In 1881 the sister vessel Dimitri Donskoi was commenced. Then came the Admiral Nachimoff, a copy of our Imperieuse and Warspite, in which the displacement was increased to 8000 tons, and the speed to 16½ knots. All three vessels were employed in the Chinese seas, and were much superior to the Audacious class, which for many years were sent to the Pacific and China as flagships. Another efficient cruiser is the Pamyat Azova, a vessel of 6000 tons, with a 6-in. belt and a speed of 18 knots. Through all these years Russia has adhered to the belted cruiser. Horizontal armour has failed to charm her. No copies of the Blake and Blenheim will be seen in the Russian Navy. Her latest idea of an armoured cruiser can be found in the vessel of which the keel has just been laid. It is stated that this vessel is to be 426 ft. long, with a beam of 67 ft., and a displacement of 11,000 tons. She will have an armoured belt for 340 ft. of her length, associated with 2½ in. deck protection. The coal supply is to give a radius of 20,000 miles at 10 knots. The proposed armament is to consist of 34 guns, varying in calibre from 8 in. to 4·7 in. The anticipated speed is 18 knots with natural draught. It may be observed that, having the same beam as the Blake and Blenheim, the latest type of Russian cruiser is to be 50 ft. longer, which will give many advantages for distant cruising and long voyages.

Has Defence Act made England safe.

And now let us ask ourselves, Has the Defence Act made England safe? The answer to this question can best be supplied by comparing the naval forces at our disposal with those of other Powers. The

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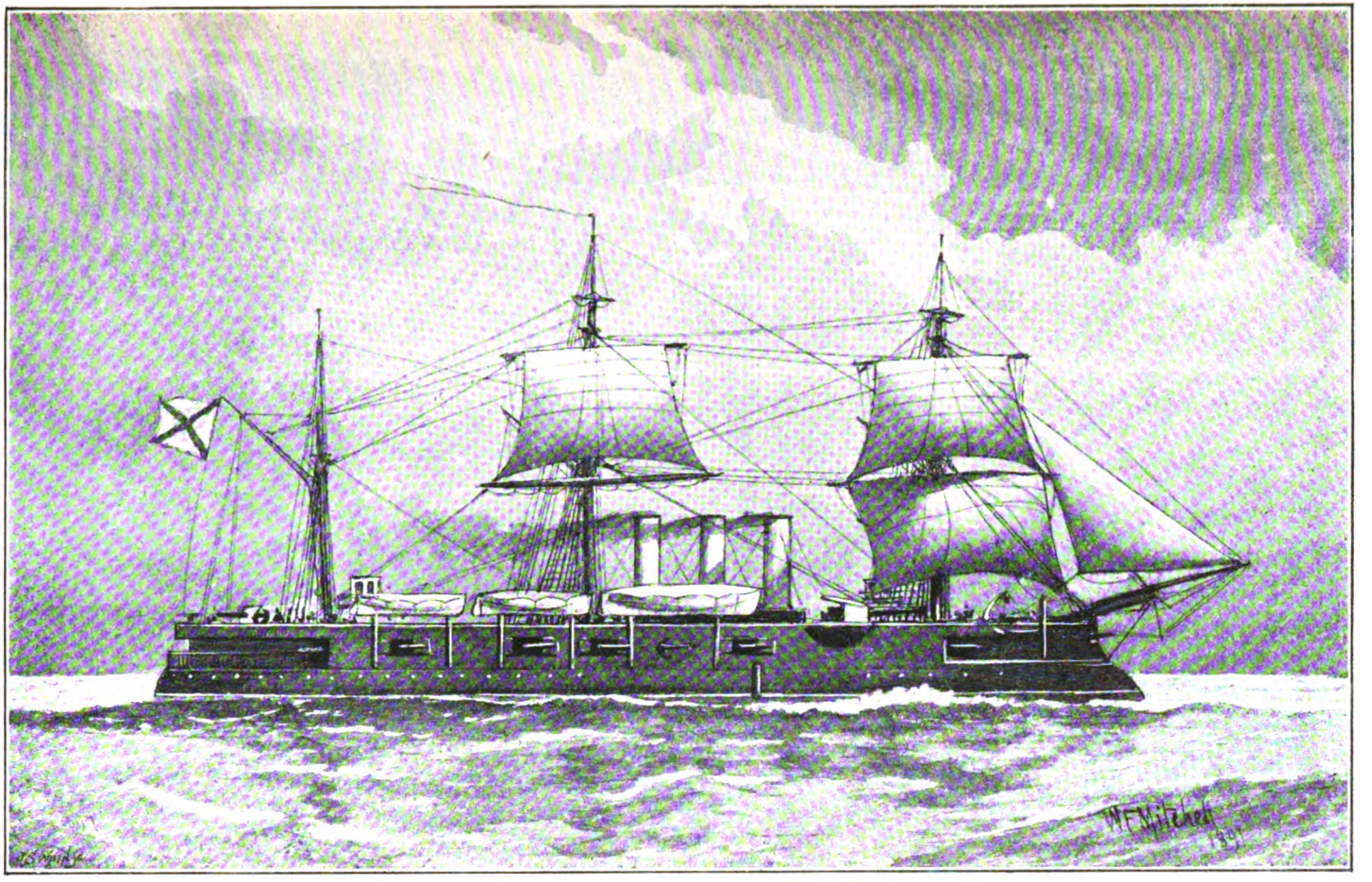

"PAMYAT AZOVA."
RUSSIAN ARMOURED CRUISER.

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Admiralty have laid down as the standard for Great Britain that our Navy should be equal in strength to the combined navies of any other two nations.

In considering the vital question of the protection of commerce, it is difficult to fix a limit to our requirements. At the present time the merchant marine of the fifteen chief nations in the world is distributed as follows:— Commerce to be protected.

Countries.	Sailing Vessels.			Steamers.			Total Tonnage, multiplying that of Steamers by Three.	Rank.
	No.	Net Tonnage.	Rank.	No.	Net Tonnage.	Rank.		
British Empire	6180	3,524,000	1	4885	6,873,000	1	25,429,000	1
France . .	920	245,000	8	490	740,000	2	2,466,000	4
Germany . .	1292	684,000	4	640	726,000	3	2,862,000	3
United States	3148	1,402,000	2	425	546,000	4	2,951,000	2
Spain . . .	514	139,000	12	380	399,000	5	1,355,000	7
Italy . . .	1461	563,000	5	201	284,000	6	1,416,000	6
Netherlands .	390	166,000	10	149	191,000	7	737,000	9
Norway . .	2929	1,271,000	3	329	185,000	8	1,827,000	5
Sweden . .	1029	299,000	6	491	163,000	9	799,000	8
Austria . .	255	127,000	13	125	149,000	10	575,000	11
Denmark . .	198	119,000	14	196	140,000	11	539,000	12
Russia. . .	997	278,000	7	220	139,000	12	696,000	10
Japan . . .	150	40,000	15	172	134,000	13	444,000	14
Greece . .	865	249,000	9	84	72,000	14	555,000	13
Turkey . .	791	153,000	11	84	64,000	15	345,000	15

In the discussion on the French Navy Estimates M. Gerville-Réache, the reporter of the Budget Committee, compared the fleets of France, the three allied powers, and England, stating that "these powers will have in 1895 the following vessels: Ironclads of 10,000 tons or over, France 13, Triple Alliance 17, England 22; ironclads of less than 10,000 tons—France 20, the Triple Alliance 30, England 32; coastguard ships and gunboats plated—France 22, the Triple Alliance 29, England 15; plated cruisers of more than 4000 tons—France 11, the Triple Alliance 13, England 31; plated cruisers of from 2000 to 4000 tons—France 5, the Triple Alliance 17, England 51; Relative strength of navies.

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despatch boats and small rapid cruisers—France 13, the Triple Alliance 18, England 36; counter torpedo boats—France 13, the Triple Alliance 39, England 44; torpedo boats—France 187, the Triple Alliance 372, England 156. There will be besides to carry the torpedoes seven special vessels among the united powers, three in England, and none in France. Lastly, France will have 16 cruisers of the old type, the Triple Alliance 24, and England 15." M. Gerville-Réache arrived finally at the conclusion that France will have 299 ships fit for service, the Triple Alliance 556, and England 402.

A more detailed comparison of the strength of the English, French and Russian Navies will be found in the comparative tables of Part IV.

Conclusion.

If we look back fifty years, it must be evident to the most anxious alarmist that the position of Great Britain in the scale of nations has been greatly raised. A combination of the French and the Turkish fleets would not be viewed by Lord Salisbury with the apprehension which was felt in 1840 by Lord Melbourne.

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CHAPTER XI.

Future Policy of War-Ship Building.*

In selecting the naval programme of the future as the subject of the present paper, I have chosen a topic which it is not premature to discuss. The Admiralty at the present time has large resources at its disposal, and the reinforcement of the Fleet is being pushed forward with ability and energy; but the time must shortly come when a further programme of shipbuilding should be considered, and the administration of the day will once more address itself to the difficult task of deciding between the conflicting views of eminent authorities. When it is considered how great is the issue at stake, how large the expenditure involved, how hazardous to lay down ships in batches before a single specimen has been tried at sea, the value of discussion as a preliminary to action will be readily admitted. It was well illustrated in the case of the Royal Commission presided over by Lord Dufferin. Their able Report was for many years a leading light for the shipbuilding policy of the Navy. We cannot claim to speak here with the authority of Royal Commissioners, but I shall hope that it may be of some service to the Admiralty that the construction of the future should be debated by the Institute of Naval Architects.

Necessity for discussing future programme.

As a preliminary remark I desire to say that if I do not propose a programme, in all its features identical with that now in course of execution, and which may be appropriately designated the "Hamilton" programme, it is certainly not my intention to imply criticism or disapproval. Happy in their opportunity, the present Admiralty resolved to bring up the strength of the Navy to the level of the country's requirements; and in the selection of types they wisely went beyond their immediate advisers to the officers who, by their recent experience in the command of fleets, were the best qualified to give counsel to the administration.

Hamilton programme.

In considering the programme of future construction, it is essential to keep clearly in view the twofold duty of the Navy:—

Twofold duty of Navy.

* This chapter is the paper read before the Institute of Naval Architects, with additions and emendations.

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I. Defence against invasion.

II. Protection of commerce.

Captain Mahan, in his admirable volume, lays it down that "the enemy's war-ships and fleets are the true objects to be assailed on all occasions."

Best means of defence.

The defence of the Empire from invasion will be best secured by placing British squadrons in face of the enemy wherever he may be. By this offensive defence we bar the only possible line of attack in the most effective way. To use words quoted by Captain Cleveland from Lord St. Vincent, we must "beard the lion in his den, and never relax the grip." It has been laid down by eminent naval authorities that, in order to blockade successfully, the force outside must be double the force inside. The blockading force should include torpedo gun-vessels for the inner line, cruisers for the second line, and battle-ships for the outer squadron. The proper complement of store and torpedo depôt vessels must be provided.

What are the operations by which the Navy should give protection to British commerce?

(*a*) Command of sea to Cape Finisterre.

(*a*) The Navy must sweep the English and Irish Channels and their approaches, and guarantee security over the entire space included between the coasts of Ireland and the Peninsula. The cruisers for this work may be of moderate dimensions. The Apollo, Medea, and Pallas classes, forming part of the Hamilton programme, provide a large instalment of the vessels required for this important service.

(*b*) Patrol in ocean.

(*b*) As the range becomes wider, protection must be given, in the open ocean, by patrol; in narrower seas, by convoy.

Probability of transfer to neutral flag.

In war the Atlantic trade will not be the principal care of the Navy. We may anticipate a considerable temporary transfer of tonnage to the flag of the United States. "England's extremity," as Sir Charles Dilke has pointed out, "would be America's opportunity, . . . the greater portion of our commerce will pass in case of war under the American flag. High prices would attract American enterprise: the United States would cover with the stars and stripes an immense food traffic; and the fleets that were 'investing' us would have to meet the combined energies of the British Empire and of the republic." The ships which will remain under our national flag will be secured from the risks of capture by their superior speed.

It is on the route to the East and to South America that British commerce will most need the protection of the Navy. It is a fatal objection to the use of the Suez Canal in war

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that it can be easily blockaded by operations which it would be impossible to prevent so long as it was permitted to remain open to trade. To close the Canal, and by the action of the Navy prevent a hostile occupation of Egypt on the outbreak of war, is the policy most consistent with a true view of British interests. We stand prepared to contend for the supremacy of the seas in the Mediterranean as elsewhere; but in the view of many naval authorities, on the outbreak of war, the route to the East will be *viâ* the Cape. The tracks along which all ships must travel must be defined by Order in Council, and should be traced, as Captain Cleveland has suggested, at the greatest practicable distance from any ports which might be used by an enemy's cruisers. Long distances separate the fortified coaling stations on the Cape route, and efficient cruisers for the protection of our trade on that route must have high speed, great coal endurance, and be capable of keeping the seas for extended periods. They must, therefore, be of large dimensions.

Protection of commerce to East and South America.

From Ceylon to the Straits and thence up the China Sea, the distances to be traversed from coaling station to coaling station are sensibly less, while the number of ports in which hostile cruisers could lie *perdu* is such that we cannot entirely rely upon the method of protection by patrol. Between Singapore and Shanghai the Navy should be prepared to give escort to convoys starting at frequent intervals. The older ironclads, with improved coal-endurance, and the protected cruisers of the C class, might be efficient for this duty.

East.

Having indicated the nature of the duties which might be efficiently performed by the older ironclads, it may be observed in passing that it would be an obvious operation of war for a fleet of ironclads, when sent out to Eastern waters, to attack and take possession of any hostile coaling stations on the line of communication. If this were done, India would be secure. The capture of his coaling stations would make it impracticable for a hostile Power to send ironclads from European ports to attack Bombay.

Capture of enemy's coaling stations.

The trade with South America, from a rendezvous off St. Paul's to the River Plate, should be conducted by convoys similarly escorted.

South America.

In considering the programme of the future we must have regard, not only to naval requirements, but to political and financial considerations. The Admiralty has properly recognised that it cannot demand unlimited sums from the Treasury. It has been officially announced that it is the policy of the present Government to keep the British Navy at a standard of strength at least equal to any

Programme of future.

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other two Powers combined. Looking to the rapid transitions which are taking place in the instruments and methods of naval warfare, I take no exception to the standard proposed, so far as relates to ships for the line-of-battle and their auxiliaries. For cruisers, the measure of our requirements must be drawn rather from the tonnage to be protected, and the increased difficulty of maintaining a strict blockade, than from a comparison with other Powers as to the number of ships on their navy lists.

Comparison of relative strength.

At this stage it will be necessary to submit some comparative statements. In recent volumes of the *Naval Annual* tables have been published showing the relative strength of England, France, and Russia, in the various classes of armoured and unarmoured ships. In the present paper these tables have been brought up to date, the principal authority consulted being the issue for 1891 of the well-known Austrian *Almanack*. It will be sufficient for the purpose of a general comparison to give the total number of ships and their aggregate tonnage in the several classes. Comparative lists of the ships are given in Part IV., commencing at page 420.

Difficulty of comparison.

All comparisons are most difficult, and open to destructive criticism. As a general rule, as between ships of approximately even date, the relative fighting efficiency varies as the tonnage. It must be presumed that the naval architects who enjoy the confidence of the administrations of the great Powers, are equally skilful in obtaining the best results for a given displacement. Every ship is a compromise. In one case more importance may be attached to protection, in another to speed and coal-endurance, in a third to armament. All these elements are of value, and, as we cannot know beforehand the nature of the service on which vessels may be employed, it is impossible to determine with precision their relative importance.

BATTLE-SHIPS.

First Class.

England . . .	32 ships,	aggregating	354,950 tons.
France	14 „	„	151,682 „
Russia	6 „	„	57,617 „

Second Class.

England . . .	18 ships,	aggregating	89,000 tons.
France	13 „	„	98,101 „
Russia	4 „	„	21,172 „

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UNIV. OF CALIFORNIA

AUXILIARIES TO BATTLE-SHIPS.

I.—Look-out Ships.

ENGLAND.

Number of Ships.	Type.	Tons.	Speed.
			Knots.
2	Iris	3,730	18
2	Barham	1,830	19½
4	Barrosa	1,580	16½
11	Archer	1,770	17
	FRANCE.		
2	Fleurus	1,310	18
4	Condor	1,240	17

II.—Torpedo Gun-Vessels.

ENGLAND.

1	Polyphemus	2,640	18
15	Sharpshooter	735	21
4	Rattlesnake	525	19
	FRANCE.		
2	Not named	850	..
5	Leger	450	19
8	Bombe	320	18

COAST DEFENCE AND THE INSHORE SQUADRON.

England . . .	12 ships,	aggregating	47,720 tons.
France	23 „	„	83,727 „
Russia	24 „	„	58,374 „

ARMOURED CRUISERS.

England . . .	18 ships,	aggregating	137,050 tons.
France	12 „	„	63,446 „
Ru sia	8 „	„	63,223 „

PROTECTED CRUISERS.

First Class.

England . . .	11 ships,	aggregating	85,550 tons.
France	6 „	„	29,779 „
Russia	1 „	„	5,000 „

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Second Class.

ENGLAND.

Number of Ships.	Type.	Displacement.	Speed.
		Tons.	Knots.
24	Apollo	3,400 to 4,360	19½ to 20
3	Medea	2,800	20
2	Marathon	2,950	19
9	Pallas	2,575	19
4	Mersey	4,050	18
4	Amphion	4,300	17
	FRANCE.		
6	Cosmao	1,850	19½
2	Davout	3,027	20
	RUSSIA.		
2	Rynda	2,950	15

SUMMARY OF SECOND AND THIRD CLASS PROTECTED CRUISERS.

England . . .	46 ships,	aggregating	157,505 tons.
France . . .	8 „	„	17,208 „
Russia . . .	2 „	„	5,900 „

Ships for the police of the seas are not included. Our superiority in this class, not perhaps of much value, will be admitted.

Explanation of tables.

A few observations may be given in explanation of the tables. The oldest British ship in the list of first-class battle-ships is the Devastation, launched in 1871. The oldest ships in the French list are the Amiral Duperré and the Dévastation, launched in 1879. The oldest Russian ship is the Peter the Great, launched in 1872.

1st-class battle-ships.

In battle-ships of the first class, built and building, our strength, in comparison with that of the two Powers named, cannot be said to fall below the Admiralty standard. We are building ten ships to four of the French Navy, and three for the Russian Navy. This proportion, satisfactory at the present, may be suddenly altered by a decision elsewhere to lay down new vessels and to push their construction vigorously. No abatement of the efforts now being devoted to battle-ships is warranted under existing conditions.

Auxiliaries to battle-ships.

Auxiliary vessels are indispensable supports for the battle-ships. A writer in the *Revue des Deux Mondes* fixes the relative composition of the future fleet best suited for naval tactics at twelve ironclads, six

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cruisers of from 3000 to 5000 tons, six gunboats of from 400 to 1200 tons, and twelve sea-going torpedo-boats of from 100 to 150 tons. We are far below our requirements in the auxiliaries to battle-ships. The same observation applies with at least equal force in the case of foreign Powers.

2nd class battle-ships.

In ships of the second class actually available for service England stands obviously below the standard of equality to a combination of any two Powers. In the near future our relative position will be stronger. A large proportion of the French ships launched between the years 1865 and 1875 having been built of wood, must shortly be removed from the lists. It does not, therefore, appear necessary to give special prominence in the future programme to the construction of second-class fighting ships. It will be sufficient if we give a moderate reinforcement to the fleet in ships possessing the capabilities of the Caïman type of the French Navy for operations in the Mediterranean and in narrow waters.

We shall deal later with the repairs of the second-class ironclads.

Coast defence ironclads.

Turning to the ships for coast defence, in the French list have been included the old wood-built vessels Bélier and Bouledogue, Taureau and Tigre, and the Onondaga, an iron monitor. Eight of the French vessels are armoured gunboats, four of 1640 tons and four of 1050 tons. The other French coast-defence ships are beyond comparison more powerful than any ships on the British list. Four have quite recently been laid down.

The Russian list includes ten monitors and two Popoffkas, all being essentially harbour-defence vessels, and not available for offensive operations.

Our inferiority in coast-defenders is evident.

Armoured cruisers.

In the class of armoured cruisers are included, in the British list, six ironclads of the earliest type. Obsolete as battle-ships, they could be adapted at a comparatively moderate cost for the protection of commerce on the distant stages of the ocean highway to the East. In those waters no hostile battle-ships of modern construction are likely to be found.

Protected cruisers.

In the classification of the cruisers it has been difficult to draw the line between the armoured and protected. All the cruisers in the armoured list are belted. All those classed as protected have an armoured deck. It does not follow that a greater weight has been appropriated to armour, or that the protection is more complete in the armoured cruisers than in the case of the vessels classified as protected. In his description of the Blake and Blenheim in the House of Commons, it was stated by Lord George Hamilton that in

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our later cruisers the strong protective deck over the vitals, in association with certain novel arrangements for protecting the guns and the guns' crews from shell fire, had been adopted after much consideration by the Admiralty as superior to the usual protection by a narrow vertical belt of moderate thickness.

Cruisers building.

The three lists of cruisers, taken together, show a decided balance in favour of England. In proof of the energy with which the building of cruisers has been pushed in this country, we may compare the magnificent list of ships included in the Hamilton programme with the ships in construction in France and Russia. The French are building the armoured cruiser Dupuy-de-Lôme, the four Charners, the three protected cruisers of the Alger type, and the five of the Davout type. Russia has the armoured cruisers Navarin, 9476 tons, 16 knots; and Rurik, 10,000 tons, 18 knots. We are now advancing —and our necessity for the protection of commerce requires it—at much more than double the rate of France and Russia combined. For the German Navy four cruisers of the first class are in construction. Three have a displacement of 5500 tons, speed 20 knots, two 18-ton, and eight 6-in. guns. The smaller vessel, of 4800 tons, has a similar speed and armament.

Types.

As a preliminary to the consideration of a future programme, it has been necessary to make comparison with foreign Powers. Let us pass on to the consideration of types.

Battle-ships.

First, the battle-ships. It must be laid down as an axiom that a fleet sailing under the British flag must be prepared to go anywhere and to do anything. Our vessels must be of a type in which life at sea during long voyages will not be intolerable to the crews. They must be in the fullest sense sea-keeping and sea-worthy. To fulfil these conditions, ample freeboard is most desirable. A high bow is essential, in order to maintain speed when contending with strong head winds. In height of bow and of freeboard, French designs for first-class battle-ships have had in times past the advantage over their British contemporaries.

Speed and coal supply.

In the important quality of speed, we may rest content with 17 to 18 knots on the measured mile, as attained in our latest constructions. Speed will always be of essential advantage in enabling squadrons to accept or decline an engagement, and to choose the distance. In a sea-keeping squadron, under all conditions, and especially in a long chase, coal-endurance is hardly less important than speed. If the official expectations were realised, a decided advance would have been made in this element of fighting efficiency. From the statements which have appeared in the Press, it would

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seem that on practical trial the coal-endurance has in many cases proved greatly below the estimate. In the first-class battle-ships of the latest type a coal supply of 900 tons has been provided. It would be desirable to increase the supply to not less than 1000 tons. At a cruising speed of 10 knots, the coal supply of the battle-ship should suffice for a distance of 7000 knots. This would give a margin, even for a passage across the Atlantic. History repeats itself; and Nelson's pursuit of Villeneuve is an illustration of one of the practical requirements of the operations of naval war.

Armaments.

We now come to the armaments. In the main armaments of the battle-ships of the future it is not probable that the ponderous pieces which have of late been mounted on board ship will be included. The objections to monster guns are the limited endurance, difficulty of manufacture, excessive cost, slowness of fire, length, and hence liability to be struck and possibly disabled, and dependence on hydraulic loading gear, perfect in its working under peace conditions, but too susceptible of injury for the practical purposes of war, and requiring armour for its protection.

Heavy guns.

The naval advisers consulted by the Admiralty on the Hamilton programme considered that the heaviest gun for battle-ships should not exceed 50 tons. Admiral Scott places the limit of weight at 30 tons. He stands by the principle that no gun too ponderous to be worked by manual power should be mounted on board ship. A 29-ton gun is relatively cheap, durable, and easy of manufacture. Its power of penetration is equal to 21 inches of iron at a thousand yards, and is sufficient for all practical purposes.

The number of heavy guns which can be carried must depend on the limits fixed for the displacement. A battle-ship should be able to carry at least four 29-ton guns.

Quick-fires.

A large appropriation of displacement is now required for the quick-firing armaments. Within the range of an accurate and effective fire from a heavy gun on an adversary in motion quick-firing guns can pour a hail of bullets on conning-towers, turrets, and open ports.

Gun positions.

The gun positions must be determined by tactical considerations. The battles of the future will probably commence, as at Lissa, with attempts to ram. As the hostile vessels advance, each will endeavour to keep down the fire of the opposing ship by an incessant hail of bullets from the quick-firing and machine guns. The ships will return again and again to the charge until the issue is decided. For such a combat it is essential to carry both main and minor armaments in positions giving the greatest command of fire in the end-on position.

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Distribution of armour.

We have now to deal with the vexed question of protection for the hulls, guns, and crews by armour or other means. The distribution of armour has gone through many phases. Naval architects began with thin armour and a large protected area. The advance in the power of the gun led to increased thickness of armour. As the thickness increased the area protected was reduced, and reliance was placed on numerous water-tight compartments to be packed with stores or light material or otherwise and cofferdams. The introduction of projectiles charged with high explosives has rendered it indispensable to return to the system originally adopted, and to protect the upper works of ships with armour of limited thickness but of extreme hardness, capable of exploding shells outboard.

Thickness of armour.

It is impossible to fix the thickness of armour on any certain basis. Armour of the utmost practicable thickness can be penetrated by the big guns, from which the most destructive shells would be discharged. Comparatively thin armour is of extreme value as against quick-firing guns. In actual warfare the protection afforded has always been superior to that obtained in target-practice, where every condition is in favour of the gun. In the action fought between the Huascar and the Shah the former vessel, though struck by seventy or eighty projectiles, received no serious injury, although, according to the tables of penetration, the Shah's projectiles should have pierced the armour of the Huascar.

Admitting that any limit is arbitrary, I would submit that reasonable conditions of fighting efficiency in relation to armour would be met by a protection of 12-in. plates at the water-line abreast of machinery, boilers, and magazines, and on the turrets and the conning-towers.

Protection of minor armament.

Since the introduction of quick-firing guns, it is no longer possible for crews to stand in the open without some protection. Much ingenuity has been shown in the ships now under construction in the contrivance of shields for the auxiliary armament. Batteries must be protected by side armour; five inches of steel or compound plating would probably keep out 90 per cent. of all save the heaviest shells.

Dimensions.

Having dealt with the several elements which collectively constitute the fighting-efficiency of a battle-ship, we have now to consider the limit of dimensions. With every increase of displacement, the naval architect can give more effective armament, stouter armour, a higher and more enduring speed, more ample coal supply. On the other hand, if dimensions can be kept within a margin of say 10,500 tons as against 14,000, the same tonnage will give eight ships against six. There are few admirals who would not make some sacrifice in

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individual power for a decided advantage in numbers. No increase of displacement will guarantee invulnerability against the ram or torpedo, or strengthen the means of defence against the attack of a puny assailant under cover of fog or darkness. No practicable thickness of armour is impenetrable. Captains of ships and captains of guns must under all circumstances be exposed. In the Huascar's conning-towers three commanders were slain in half an hour. The best disciplined and most valorous crew must be paralysed, at least for a few moments, and, possibly in the very crisis of an engagement, by the loss of their commander. It is a further argument against the big vessels of deep draught that the number of harbours which they can enter are few, that they must keep in the offing on many coasts, and cannot pass the Suez Canal.

Advantages of numbers.

The arguments for increasing numbers by insisting on some limits of dimensions and cost, as against the policy of building fewer ships of greater individual perfection, have been admirably put together in a paper recently issued from the Naval Department at Washington:—

Opinion in United States.

". . . The process of reaching perfection is an experimental one, and is accompanied by many mistakes. The lack of important naval battles in recent years stands in marked contrast to the desperate efforts of European Powers to equip extraordinary vessels designed to combine the invulnerable and the irresistible; and to the rarity of great sea fights may be indirectly attributed the superabundance of types, for we cannot but believe that a war of moderate duration between first-class naval Powers would speedily settle such vexed questions as the utility of the wholly armoured water line *versus* the citadel ship, and would fix irrevocably the status of such craft as the Esmeralda and the Giovanni Bausan. Such a war would doubtless demonstrate that the elaborate schemes of fleet tactics, which have been the theme of many essays by naval officers, have been chiefly valuable as a mental exercise; and that although much importance may attach to a skilful disposition of forces in the beginning of an engagement, yet in view of the rapidity with which vessels would be disabled by the tremendous means of offence antagonised, and the inability to see or obey signals amid the confusion and obstructing smoke, it is evident that such an engagement must presently become a pell-mell scrimmage. Such a war, or one such battle, would prove what has long been the apprehension of intelligent officers, that the war-ship of our day has become far too complicated for the people who may be called upon to work her; and that a balance of advantage, unsuspected by many, rests with that vessel which has comparative simplicity, even though it be concomitant with a

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greater exposure of life, a lower speed, and reduced powers of offence."

Construction in progress abroad.

In the perplexity of mind induced by conflicting arguments and theories, we may perhaps find some guidance for ourselves in the construction in progress elsewhere. The vessels most recently ordered by foreign administrations include the following:—

			Tons.
Germany	4 Battle-ships,	displacement	10,000
	4 Coast-defence ships,	„	3,495
Russia	1 Battle-ship,	„	10,480
	1 „	„	10,000
	1 „	„	9,000
France	3 Battle-ships,	„	12,000
	1 Battle-ship,	„	11,000
	4 Coast-defence ships	„	6,600
Italy	4 Battle-ships	„	14,000
United States	4 „	„	10,000

In United States.

In the United States the design for the armoured ships have received most careful consideration, both from the Policy Board and the Navy Department. The Americans are untrammelled by traditions, or by the possession of a numerous fleet not of the latest type. They have always shown themselves bold and ingenious inventors, and in their close observation of what is going forward abroad, and their readiness to copy whatever commends itself to the judgment of the very able officers of their Navy, they belong essentially to the eclectic school of naval constructors. It is well to take note of the decisions resulting from their latest deliberations.

Dimensions.

The Policy Board have laid down the following standards for the dimensions of the several classes:—

		Tons.
First-class Battle-ship, of great coal-endurance	displacement	10,000
„ „ of limited coal-endurance	„	8,000
Second-class Battle-ship, 4600 knots at 10 knots	„	7,100
Third-class Battle-ship „ „ „	„	6,000

The Secretary of the United States Navy proposed the following programme to Congress:—

10	Battle-ships of	10,000 tons.
8	„ „	8,000 „
12	„ „	7,000 „
5	„ „	6,000 „

As stated in the American *Army and Navy Journal*, Congress has approved the immediate construction of three ships of 10,000 tons.

Italy.

The policy adopted in Italy is vindicated by its authors on the ground that, as their country is unable to vie with others in the amount of tonnage constructed, it is necessary to secure the utmost development of power in a limited number of ships. The building

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of ships of extreme dimensions is of doubtful expediency, even for Italy, where only one ironclad on an average is completed in every two years.

France. The larger dimensions recently adopted by the French Navy Department have been severely criticised by M. Weyl, and by naval officers of the school of Admiral Aube.

Compiler's opinion. In view of all the considerations which have been urged, I shall hazard the opinion that the dimensions of the battle-ship of the future should not exceed 10,500 tons, nor should the cost exceed £600,000.

Barfleur and Centurion. In the Barfleur and Centurion now building, armed with four 29-ton guns and an effective minor armament, with a speed of 18 knots, and much protection by armour, we have a design which gives to the nation as good value for the cost as, under existing conditions, it seems practicable to secure. Ships of these dimensions offer an advantage, not easily to be measured, over costlier types, in the larger number which can be built for the given expenditure.

Auxiliaries to battle-ships. From the battle-ships we pass to their auxiliaries, the look-out ships, torpedo gun-vessels, armoured rams, floating gun-carriages for bombardment, and torpedo-carriers.

1. Look-out ships. As look-out ships, attached to a fleet operating in the Mediterranean, on the coasts of Europe, and in the Channel, we have efficient types in the cruisers of the Pallas and Medea classes. In look-out ships speed is essential, armament subordinate. In the new ships it has been wisely decided to carry a lighter armament. The Archer class, the immediate predecessors of the ships building under the Hamilton programme, are overcrowded with men, guns, torpedo tubes and machinery. Relieved of some of their load they would be more efficient for their special duties. For our 32 first-class battle-ships we require at least 64 look-out ships: we have 19 on our Navy List.

2. Torpedo gun-vessels. As auxiliaries to the battle-ships, torpedo gun-vessels are not less indispensable than the look-out ships. In open daylight a battle-ship, using smokeless powder, would probably be successful in warding off an attack by torpedo-boats. At night, as a weapon of surprise, the torpedo-boat is a formidable assailant. A fleet cannot undertake to blockade, or even to mask a hostile port, without the protection of a large flotilla of sea-keeping torpedo gun-vessels. Within a limited radius these vessels would be efficient as look-out ships. Torpedo gun-vessels should have a high speed, and an armament of quick-firing guns. By increasing the displacement to 735 tons, we have produced a successful type. The French con-

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template building vessels of 850 tons, and the limit will probably be found at 900 tons. It will be necessary to push on the construction of torpedo gun-vessels of the most approved types.

Expenditure on older ironclads recommended.

In recommending expenditure on the ironclads of the early types, I do not look for much support from the professional naval architects of this Institution. The desire is natural to devote all the money available to push forward the construction of ships of the latest designs. With greater confidence I will make an appeal to the naval officers—Associates of this Institution—who would form an entirely independent opinion as to the best manner in which to apply the public money available for the building and maintenance of the fleet.

The superior foresight and ability with which the work of armoured construction was begun in this country have given us a fleet of ironclads of the earlier types considerable in numbers, and still, I would contend, of substantial value. It is surely of great advantage to the British Navy that while the earlier ships built by foreign Powers are beyond repair, their British contemporaries, though obsolete in machinery and armament, are as sound in hull as when they were first launched. In the distribution of armour these older vessels approach much more nearly than do their successors to the requirements which the introduction of quick-firing armaments and highly explosive shells has imposed. The Alexandra, Hercules, the Achilles, and Audacious classes are noble ships, and are well worth fitting with modern machinery and armaments. With powerful and economical engines, and a good armament of light and quick-firing guns, the earlier ironclads would be of the greatest value for the protection of our trade in the furthest East by the method of convoy. I should deplore a final decision to abandon the Sultan to decay.

Coast defence.

We have now to deal with coast defence. The flotilla for this purpose should include rams, monitors, and armed torpedo-vessels of the Polyphemus type improved. For coast and harbour defence a torpedo flotilla has been proved to be in a high degree effective. Seven ironclads and eleven other vessels were sunk by defensive torpedoes during the American War of Secession. In the war with Paraguay the Brazilian ironclad Rio de Janeiro was destroyed by similar means. During the Russo-Turkish war the Turks lost a gunboat and a monitor in the Danube, and a steamer of 1200 tons at Batoum.

Torpedo-boats.

Experience has shown that the smaller torpedo-boats are unseaworthy. Those recently constructed in England are of about 100 tons displacement. Germany, Italy and Russia are building

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boats of 130 to 160 tons. It will probably be well to have torpedo-boats of two classes. The first class, of not less than 150 tons, should be able to cruise with the fleet within a certain distance from the coast. The second-class boats, for harbour defence, may be of small size and cheap construction. In the conditions which favour the attack by the torpedo-boat upon heavy ironclads blockading a port, a small and cheap type will be almost as effective as one more costly. Of fifteen attacks with the spar-torpedo, enumerated by Ledieu and Candiat, seven were more or less successful. The same authors mention it as a notable fact that, while in all cases of frail construction, no boat armed with the spar-torpedo has yet been destroyed by the enemy's fire.

In proposing the defence of harbours by a torpedo flotilla, I offer no new suggestion. In inviting attention to the Monitor type, I enter on more debatable ground.

Monitors.

The Monitor was designed by Ericson with the view to reduce as much as possible the surface exposed to the enemy's fire. It was capable of floating at a light draught. In the bombardment of Charleston 2330 projectiles were fired by the forts. The monitors, though struck 256 times, sustained no serious injury, and must therefore be pronounced to have been thoroughly efficient for coast service and harbour defence. With their deck openings properly closed they withstood the fury of raging seas. In the United States the qualities of the Monitor type have always been highly appreciated, and a heavy expenditure has been recently incurred in rebuilding many of the original vessels.

British coast-defence vessels must be seaworthy.

For a naval Power which aspires to hold the command of the sea, mere coast-defence ships are not, it will be admitted, an important class. The recommendations of former commissions in favour of building a few defence vessels for our principal harbours, have, perhaps, been too long neglected. It seems possible that a future programme might advantageously include monitors capable not only of doing service for defence, but also of acting as part of a fleet blockading an enemy and possibly bombarding his ports. Any vessels of the coast-defence class laid down for the British Navy should be seaworthy, and efficient for any service in the Channel and the Mediterranean. A lower speed and more limited radius of action may be adopted than in the case of first-class ships.

French coast-defence vessels.

In France, where the shipbuilding policy is framed to meet somewhat different conditions, constant attention has been paid to the coast service and along-shore section of the fleet. Eight armoured gunboats have recently been completed. Four powerful turret-ships,

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of the Valmy or improved Furieux type, carrying two heavy guns in separate turret, and having a speed of 17 knots, have just been laid down. Our last addition to the British Fleet in coast-defence vessels was made in 1871, when Mr. Goschen's Board ordered the four Gorgons.

Rams. The power of the rams when successfully aimed, has been shown in the destruction of the Ré d'Italia by the Ferdinand Max at Lissa, and in the disastrous collisions between the Thetis and the Reine Blanche, the Iron Duke and the Vanguard, and the König Wilhelm and Grosser Kurfürst. The officers of the American Navy who served in the War of Secession were deeply impressed with the value of the ram. In the narrow waters in which their actions were fought it was sometimes used with great effect. The American Board of Naval Policy recommended a ram with a displacement of 3500 tons. The Navy Department has produced a design, now in course of construction, of 2050 tons displacement, heavily armoured, no armament, speed 17 knots.

Polyphemus. Our Polyphemus, simplified and cheapened, offers a type which we have unaccountably neglected. The French are building two torpedo-rams considerably smaller than the Polyphemus. We should build rams of a type which should not only be adapted for coast and harbour defence, but efficient for service with a sea-going fleet.

Cruisers. We have now to consider our future programme of construction in the cruiser class. The protection of British commerce can only be effectively performed by building cruisers which shall have a superiority over the ships of other Powers in all that constitutes sea-worthiness, ability to keep the sea, and fighting efficiency. It is not with Archers and Bellonas, but with our Blakes and Edgars that we must patrol long stretches of sea. The high authority of Mr. White may be claimed in support of a policy of building cruisers of large dimensions. In a paper read last year at this Institution he insisted strongly on the advantages of size in relation to enduring speed in open water, coal supply, steadiness of gun platform, power of concentrated attack, and protection; and while contending for the utility to the Royal Navy of the smaller vessels, he fully admitted the necessity of large ships for ocean service. Mr. White has given practical expression to this view in the noble design of the Blake and Blenheim. In the Warspite and Imperieuse we hit upon a good type, which it would be desirable to reproduce, with certain improvements. The armament of 6-in. guns should be increased, retaining two 9-in. or 8-in. guns. The battery should be protected by 4-in. armour, and for this purpose some reduction of the armour protection on the belt

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might be accepted. The sea-going qualities would be improved by raising the bow and giving more sheer.

Causes of break-down.

In the recent designs for our cruisers the ingenuity of the constructors has been unduly taxed by limitation of tonnage. It has been sought, by the use of forced draught, to raise the indicated horse-power beyond any standard which had previously been attained with the same weight of machinery. The effort has resulted in numerous failures. Machinery has broken down, and an unprecedented disparity has been experienced in the speeds at sea, as against those attained on the measured mile. The British Navy by no means stands alone in this experience of disappointment.

In the ships of the mercantile marine, which have to contend with ocean weather at all seasons, it has never been attempted to rival the Royal Navy in the ingenious efforts to secure economy of weight.

Weight of engines deficient.

In our mail steamers on the Atlantic the weight of machinery per I.H.P. is about 280 lbs.; in cross-Channel high-speed steamers carrying no deadweight cargo it runs about 270 lbs. per I.H.P.; and in cargo steamers of modern design as much as 440 lbs. per I.H.P. The weight of machinery in the Royal Navy varies considerably. In the Inflexible, a battle-ship twelve years old, the total weight of machinery per I.H.P. is 430 lbs.; in the Howe, a first-class battle-ship of the Admiral class, it is 220 lbs.; in the Victoria, another battle-ship, 170 lbs.; in the Sardegna, an Italian ironclad recently launched, 178 lbs.; in the Medusa 161 lbs.; in the Sandfly, a first-class gun-boat, 82½ lbs.; and in first-class torpedo-boat engines it is about 60 lbs. In the Navy, machinery has been crammed into confined spaces. It has been regarded as essential that the engines should be kept below the water-line. Hence the horizontal cylinders and short connecting rods. In our later cruisers an important improvement has been introduced. Relying on the protection afforded by the armoured deck, inverted cylinders with longer bearings have been accepted, with highly satisfactory results.

Excessive armament.

While too little weight has been allowed for the machinery of our cruisers, the smaller types have been burdened with an armament more powerful than is required for the light skirmishing, which alone could be attempted in vessels of the lightest scantling, easily sinkable by a single shot. In cruisers superiority of speed and coal-endurance are the primary qualities. In the armament of the cruiser the heavy gun of the battle-ship should have no place. A protected cruiser can never engage an ironclad on even terms. The weight absorbed in the 15-ton guns and their mountings of the Mersey class might possibly have been better applied in giving

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more protection to lighter guns. In the French Navy the heaviest guns carried in cruisers are of 5 tons for the protected, and 8 tons for the armoured classes. Our Admiralty has wisely decided to substitute two 5-ton guns for the 22-ton gun originally proposed to be mounted in the bow of the new first-class cruisers of the Royal Arthur class.

Balloons.

Balloons, as fitted by the French to their ironclad Formidable, are among the newest additions to the equipment of fighting ships. Ascents have been made to a height of 2000 yards. Elevations of from 220 to 330 yards have been easily attained. By this novel application of aerostatics the horizon line can be extended from 8 to 25 miles. It will be necessary to give to our fleets this valuable addition to their fighting efficiency.

Retention of sail power.

In the Navy opinion sets strongly against the retention of sails for all classes. In the ironclads heavy masts and yards have been retained too long, and the hopeless struggle to combine sail-power with steam has sometimes, as in the case of the Inflexible, the Warspite, and the Imperieuse, been carried to the extreme. In ships of the Blake and Edgar types, propelled by two screws, canvas can be of comparatively little practical value. In the narrow seas it is not required. On the broad ocean all cruisers under 5000 tons should carry sail. The rig should be contrived with the view to rapid preparation for action. It is worth noting that in the United States Navy sails are retained for cruisers of the latest types. There is reason to believe that the coal-endurance of Her Majesty's ships is usually over estimated in the official figures. No allowance is made for the consumption of fuel for general purposes, for the difficulties of stowage in inconveniently shaped bunkers, or for the inferior qualities shipped abroad. Thus, the coal-endurance in the Mersey class, officially given at 8000 knots at 10 knots, was proved, on the outward passage to the Pacific, to be less than 4000 knots. Similarly, the coal-endurance of the Warspite, the flagship on the Pacific station, has been proved to be under 5000 knots, as against the 7000 of the Admiralty legend. Vessels of such limited coal-carrying capacity, and without the means of cruising under sail or of using supplementary sail-power are unsuitable for the Pacific station. If sail-power is abandoned, the coal-endurance of cruisers should not be less than 10,000 knots at 10 knots. For the police of the seas in the Pacific, the corvettes of the C type, which can go round the islands under sail, are more serviceable than the later vessels, with more speed but dependent entirely on steam.

In concluding these observations on cruisers, I would press most

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strongly the necessity of a large reinforcement to the Navy of first-class cruisers of the Blake and Blenheim and Edgar types. The necessity for the smaller class is obvious, but our requirements have for the present been largely provided for under the Hamilton programme.

More first-class cruisers needed.

As an early advocate of the policy of giving subsidies to mercantile auxiliaries, I rejoice that a decided step in this direction has been taken by the present Government. I would urge that attention be steadily directed to the ships in course of construction for the mercantile marine. All suitable ships should be enrolled in the list of our auxiliary cruisers. In the case of two ships recently selected as auxiliaries to the fleet—the one belonging to the Transatlantic Line, and the other to the North German Lloyd Company—the German Government have shown an example which merits our imitation, in the completeness with which every detail of an efficient armament for a merchant cruiser has been considered.

Mercantile auxiliaries.

We opened with a comparison of strength in ships built and building of the several types which are efficient for war. We may conclude with a comparision of expenditure.

The total amount available for new construction for the French Navy in 1891 is given by M. Weyl in his analysis of the estimates at £2,400,000. In the recent debates in the French Chamber, M. Barbey, the Minister of Marine, announced an increase of expenditure for 1892 amounting to £400,000. For the British Navy the amounts available for shipbuilding—new constructions—were—

Comparison of expenditure, England and France

	£
1890-91	6,777,666
1891-92	6,351,360

Having regard to the comparative situation, as we have found it upon a careful and impartial examination, it will not be safe materially to reduce the expenditure on shipbuilding until the protection of our commerce has been more fully assured. In suggesting a programme for the future, I shall assume that in the five years ensuing upon the completion of the Hamilton programme, expenditure must be maintained not far below its present level.

In framing a shipbuilding programme for the British Navy it is necessary to provide for strengthening the fleet in vessels of every serviceable type. Such a policy was well described by Signor Morin in the recent debates in the Italian Parliament. The views advocated by Signor Morin met with the warm approval of Signor Brin, the present Minister of Marine in Italy. "Signor Morin," he

Necessity for ships of different types.

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Signor Brin.

said, "has enumerated with great clearness the various theories which have been held in recent years with regard to the composition which should be adopted for the formation of our fleet, and he has shown that these theories are erroneous because they are too exclusive, and are founded on hypotheses which would never be realised in actual war."

"A few years ago torpedo-boats were supposed to be capable of destroying everything afloat; and I remember that when I was called to the Ministry of Marine for the second time and proposed the building of several ironclads, many people deplored my leaning towards these large vessels, which would be destined to be demolished by torpedo-boats. And this opinion was held, even more strongly than in Italy, by most influential men in other neighbouring countries."

"Later on public opinion became favourable to cruisers, and nothing but cruisers were wanted."

"I fully share Signor Morin's opinion that the eclectic system which we have adopted of composing our fleet of vessels of various types, and of endeavouring to make each type as perfect as possible, is the best solution; and I see with pleasure that this is no longer disputed by anyone. It is certain that the eloquent and persuasive speech delivered by Signor Morin will still further strengthen public opinion in this respect."

Compiler's suggested programme.

As a five years' programme, I would propose 10 battle-ships, 6 armoured coast-defence vessels, Monitors; 6 armoured rams, Polyphemus type improved, 40 cruisers of the first-class, 30 look-out ships, and 50 torpedo gun-vessels.

And now let us briefly consider the strength of the Navy upon the completion of the Hamilton programme and the further programme shadowed forth to-day.

We shall have 42 first-class battle-ships and 7 armoured rams, attended by 49 lookout ships and 70 torpedo-cruisers. For the defence of the Channel and our coasts we shall have 18 coast-defence ironclads and a torpedo flotilla. For the protection of commerce we shall have—

13 second-class battle-ships,
18 armoured cruisers,
51 protected cruisers, first-class,
46 „ „ second and third-class,
11 ships, C class.

Distribution of force.

The force might be thus distributed. We might retain in the Channel, and the area to the south-west of the Channel, into which

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the trade from the East and the Americas converges, the 9 armoured cruisers of the new type and the 46 second and third-class cruisers. The new first-class protected cruisers would protect the trade-route to the East, from south of the latitude of Gibraltar and round by the Cape to Ceylon. From Ceylon to Bombay and Calcutta, and eastwards to Shanghai, the trade may be formed into convoys. For their escort we shall utilise the 9 armoured cruisers of the old type, the 13 second-class battle-ships, and the corvettes of the C class.

Such a force may not be adequate for every possible emergency; but it would be beyond comparison superior to anything which could be brought against us, and behind it we should have the immense resources of our merchant service and our great industries, the alliance and co-operation of the Colonies, and the patriotic spirit of a great nation, which is instinctively maritime.

Necessity for adequate preparation.

In conclusion, I regret that I appear to-day as the advocate of a heavy expenditure on naval defence. Our necessities have been created chiefly by the policy of other Powers, who are making preparations to take the offensive if the occasion should arise. The splendid enterprise of our seamen and our merchants involves expenditure on the Navy. Year by year our shipping bears an increasing proportion to the aggregate tonnage of the world. Property of a value exceeding £150,000,000 is always afloat under the British flag. To create a trade of enormous magnitude, and to make no adequate preparation to defend it, would be to invite attack and to expose ourselves to humiliation.

The policy of this country is not a policy of aggression. More and more it is becoming a policy strictly defensive, dictated not by ambition to extend territory, but by the solicitude natural to a mother country to keep touch with the Colonies which it is her pride to have created, and which she is anxious not to lose. Such a policy is essentially a policy of peace; and a strong Navy is its least costly and surest guarantee.

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CHAPTER XII.

Descriptions of Ships Recently Completed and in Hand, Trials, &c.

Great Britain.

In the foregoing chapter we have discussed the questions of the numbers and classes of ships to be added to the several navies, and we now proceed to describe more minutely the types, and to give an account of any important steam or gunnery trials to which some of those completed have been subjected. We may appropriately commence by giving a description of the first-class battle-ship Royal Sovereign, which was floated out of the dock in which she was built on the 26th February, 1891, in the presence of Her Majesty the Queen.

Royal Sovereign Class.

The description of the Royal Sovereign applies equally to the other six first-class battle-ships, Renown, Repulse, Ramillies, Resolution, Revenge, and Royal Oak, now building in the Royal dockyards and by contract, and, with the exception of the mountings of the principal armament, to the Hood also—the large guns of the latter ship being mounted in turrets.

The history of the manner in which the design of these ships was determined on, was very fully and clearly described by Mr. W. H. White, the Director of Naval Construction, in his able paper read before the Institution of Naval Architects in 1889, and given *in extenso* in the *Naval Annual* for that year. It is not necessary, therefore, to repeat the same in this place. We give below the principal dimensions of the ship and other particulars, and for the purpose of comparison we give the same particulars for the Nile and Trafalgar, the battle-ships which immediately preceded the Royal Sovereign class.

Dimensions.

In describing the floating out of the Royal Sovereign, the *Times* gives details of the construction of the hull, which we reproduce here.

Construction of hull.

"As befits her enormous bulk and weight, the construction of the Royal Sovereign has been made exceptionally strong. The hull alone absorbs not less than 9640 tons of the total displacement, and

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	Royal Sovereign Class.	Nile and Trafalgar.
Length . . . . . feet	380	345
Breadth . . . . . „	75	73
Draught—mean . . . . . „	27 6	27 6
Displacement . . . . . tons	14,150	12,500
Freeboard {Forward . . . . feet	19 6	11 3
Freeboard {Aft . . . . . „	18 0	11 3
I.H.P. {Natural draught	9,000	8,000
I.H.P. {Forced draught	13,000	12,000
Speed {Natural . . . . . knots	16	15
Speed {Forced . . . . . „	17½	16½
Coals carried at the designed load-draught . tons	900	900
Coal-endurance at 10 knots . . . knots	5,000	5,000
Total weight of armament . . . tons	1,410	1,035
Weight of auxiliary ditto . . . „	500	135
Height of heavy guns above water-line . feet	23	15
Length of belt . . . . . „	250	230
Greatest thickness {Side armour . inches	18	20
Greatest thickness {Protective deck . . „	3	3
Total weight of armour and backing, including protecting deck . . . . . tons	4,550	4,400

of that amount about 7200 has been worked into the structure since the keel-plate was laid down on October 1st, 1889, up to the time of the floating out of dock, a period of less than 17 months. This is a record of progress which is believed to be wholly beyond precedent either in a Government or in a private yard. And this remarkable advancement is all the more creditable to the Portsmouth establishment, seeing that the Royal Sovereign was built in the open, and that work had frequently to be suspended in consequence of the very severe winter. She is built entirely of mild steel, as are now all ships in the service, the stem and stern posts and shaft brackets being also formed of mild steel castings. The flat keel-plates are each $\frac{3}{4}$ in. in thickness, whilst the vertical keel has a thickness of $\frac{5}{8}$ in., with a *maximum* height of 5 ft. amidships, tapering towards the extremities. A novelty has been introduced in this portion of the structure, as the vertical keel is perforated to allow the water to pass freely between to the first water-tight longitudinals on either side.

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These longitudinals are 3 ft. 6 in. in breadth, so that the distance between the outer and inner bottoms diminishes on passing from the middle line to the first longitudinals. Above the first there is a second water-tight longitudinal on both sides, so that, as a matter of fact, the entire hull from end to end is largely sub-divided, for the purpose of minimizing to the fullest possible extent the risk of danger to the bottom plating from rocks or torpedoes. The frames have also been specially designed with reference to the great weight to be carried, and additional stiffness is secured by double longitudinal bulkheads, which not only form a passage for easy communication below the water-line from end to end, but support the middle portions of the hull, when the ends are simultaneously on the crests of waves. A protective steel deck, 2½ in. in thickness, extends under water from the bow for about 76 ft. from the stem, and from the stern for a distance of about 72 ft. Between these, and resting upon an armour shelf, is built a belt of steel-faced armour with a backing of teak. The lower edge of the belt extends 5 ft. 6 in. below the load draught-line, while the upper edge is carried 3 ft. above the line. The greatest thickness is 18 in., the belt itself extending over a length of 250 ft. out of a total length of 380 ft., and terminating in armoured bulkheads. At the fore and after ends of the belt, and rising directly from the protective deck, are the barbettes, formed of armour 17 in. thick. Super-imposed upon the thick belt is placed another belt of light armour, 4 in. thick at the sides and 3 in. thick on the screens, running across the ship. Behind this side armour coal-bunkers are arranged, whereby a large amount of additional protection is secured. Over the armour belt there is also a 3 in. steel deck, worked so that horizontal deck protection extends from end to end.

Subdivision into watertight compartments.

Armour protection.

Protection of secondary armament.

Objection has been taken to the fact that the side armour stops short in regard to height at the auxiliary battery. It remains, however, to be stated that, while the side of the ship at this part is wholly unprotected, the guns are protected by 6-in. screens and the crews by the armoured emplacements. And in order to procure a safe passage for the ammunition from the several magazines to the guns of the secondary armament, armoured tubes have been specially fitted.

Other details.

It is also to be noted that, with a view of preventing water from finding its way below the protective deck, means are provided for closing the several openings by water-tight covers, while in the case of those which must necessarily remain open, coffer-dams have been fitted with the same object. The Royal Sovereign will be fitted

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up for the accommodation of an admiral and his staff. She will be lighted throughout with an installation of over 600 electric lights, and will also be equipped with four electric search-lights of 25,000-candle power, each of which will be worked by dynamos under protection of armour. The ship in action will be fought from either of two conning towers, of which the forward one is armoured to the extent of 14 in. and the after one to 3 in.

Arma ment.

The armament of the Royal Sovereign will comprise four 13½ in. 67-ton guns mounted *en barbette* in pairs, and firing a projectile weighing 1250 lb. with a powder-charge of 630 lb.; ten 6-in. 100-pounder quick-firing guns, the four on the main deck being mounted in casemates protected by 6-in. armour, while the six on the upper deck are mounted on sponsons; sixteen 6-pounder and nine 3-pounder quick-firers, eight small machine guns, and two 9-pounder field guns. The auxiliary armament is distributed all over the ship, and extends from bow to stern, the top sides and bridges having a considerable number disposed upon them. The main armament is worked by hydraulic machinery supplied by Sir William Armstrong & Co. The other guns are all worked by hand, the 6 in. by one man, others being employed for feeding purposes. The ship is also fitted with seven torpedo tubes, of which two are submerged. The number of torpedoes carried is 18.

Propelling machinery

The engines, which are well advanced, are provided by Messrs. Humphrys, Tennant & Co., who have also the contracts for the whole of the dockyard ships of this class. They are of the triple-expansion vertical type now becoming general in the service, and are to indicate 9000-horse power with natural draught and 13,000 with forced draught, producing speeds of 16 and 17½ knots respectively with a displacement of 14,150 tons. This noticeable increase of efficiency as compared with other battle-ships is in a great measure due to the difference in form, which was adopted as the best after a series of model experiments carried out by Mr. Froude at Haslar. On the question of speed, Mr. White has observed that the new class of ships will possess speeds exceeding those of nearly all battle-ships built or building. "They will form," he adds, "a squadron of identical character and qualities, capable of proceeding and manœuvring together. Taken as a group they will certainly be able easily to overtake any enemy's fleet. And, what is equally important, they will, under the new programme, be associated with a number of very swift cruisers and torpedo gunboats, thus constituting a force complete in all respects, and of unrivalled power as well as speed." The new ship is designed to carry 900 tons of coal, which are estimated to enable her to steam 5000 knots at 10

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knots. The arrangements for fuel are similar to those in the Trafalgar; but, whereas any increase above 900 tons in the coal put on board that ship necessitates an increased draught and some loss of speed, in the Royal Sovereign provision is made (in the form of what is known as the "Board margin") for an unappropriated weight which will enable 50 per cent. more coal to be carried at the designed load draught and at the full speed. The complement of men and officers is 700.

Second class battle-ships.

We next proceed to give a description of what are called the second-class battle-ships, two of which—the Barfleur and Centurion—have just been laid down in the Royal dockyards, the former at Chatham and the latter at Portsmouth.

Design differs from that described in Estimates of 1890-91.

The First Lord of the Admiralty in his Statement accompanying the Navy Estimates for 1891–92 gives the following particulars:—

Their principal dimensions are:—

Length	360 ft.
Breadth	70 „
Displacement	10,500 tons.

Speed on measured mile:—

Forced draught	18 to 18½ knots.
Natural draught	17 knots.
Coal supply at designed load draught	750 tons.

The armament of each ship will include:—

4 10-in. 29-tons guns in two barbettes.
10 4·7-in. quick-firing guns.
17 6-pr. and 3-pr. quick-firing guns.
5 torpedo tubes, above water.
2 „ „ submerged.

Disposition of armament.

The disposition of the armament is very similar to that of the first-class battle-ships. The 10-in. guns are mounted in pairs in armoured barbettes which extend down to the steel protective deck at the top of the armour-belt. These guns will be capable of being worked entirely by manual power, and, in addition, steam power will be supplied for the training of the guns and the supply of the ammunition.

Armour protection.

The armour protection of the hull proper consists of a belt of armour, having a maximum thickness of 12 in., extending over a length exceeding 200 ft. amidships, and completed by armoured bulkheads, with a steel deck from 2 to 2½ in. in thickness at the top of the belt. Before and abaft the armour-belt a strong protective under-water deck completes the protection to the bow and stern. The barbette armour has a maximum thickness of 9 in. Above the thick belt the broadside will be protected to a height of 9¼ ft. above water by steel armour and wood backing equivalent to a total

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thickness of 4 in. of steel. Screen bulkheads, similarly armoured, complete the protection to the sides of the barbettes. The guns forming the auxiliary armament and their crews are also well protected, either by fixed casemates, or by strong shields revolving with the mountings.

The heavy guns forward are carried at a height of 25 ft. above water, and those aft a trifle lower.

These ships, like the first-class barbette battle-ships, will be of high freeboard throughout their length, with a flush upper deck.

Increase in dimensions over those given in Navy Estimates of 1890–91.

It will be noted that the size of these second-class battle-ships as built will exceed the dimensions of the original estimate. This increase in size has been approved after very full consideration, and is associated with the following advantages:—

(1) Wood and copper sheathing on the bottoms, adapting the vessels for employment on distant services, where docking facilities may not be available.
(2) An increase in the weight of armament, both of guns and torpedoes.
(3) Improved protection, in the form of casemates, to the guns in the auxiliary armament.
(4) Larger and heavier boilers, giving a higher development of power for continuous sea service.
(5) The limitation of extreme draught, when fully laden, to 26 feet.

Board Margin and coal supply.

If these vessels are completed without further demands being made upon them for additional weights to be carried in connection with the armament or equipment, and the Board Margin allowance not required, they will be capable of carrying 50 per cent. more coal than has been named above, and bunker space sufficient to carry this full supply has been provided.

Steam trial of Nile.

The following account of the steam trials of the first-class battle-ship Nile, appeared in the *Times* in July last:

Design of the ship.

"The Nile battle-ship, laid down at Pembroke on April 8th, 1886, launched on March 27th, 1888, and at the present time completing for sea at Portsmouth, concluded her contractors' steam trials at the back of the Isle of Wight a few days ago. With her sister ship Trafalgar, the junior flagship on the Mediterranean Station, she was designed by Messrs. Barnes and Morgan, of the Admiralty Constructive Department, at a time when the popular outcry against the ships of the Admiral type had reached a crisis. As a result of the crusade the new ships were given longer and higher armoured

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protection at the water-line, greater freeboard (combined with increased defence at the extremities against the fire of machine and quick-firing guns), and a turret mounting for their main armament, with consequent larger dimensions and displacement, and augmented engine power, but without any appreciable increase of speed. The Nile measures 345 ft. in length and 73 ft. in beam, with a displacement of 12,000 tons. Her complement of four 67-ton guns has been received in the dockyard, but as the War Department has failed to send them in time to be mounted previous to the trial, their equivalent in weight in the shape of water was run into the double bottom in order to give the ship the necessary immersion to render the results of practical utility as a measure of her actual performance under sea-going conditions. Her estimated load draught was 27 ft. 6 in., and at the trials her mean draught was precisely the same—27 ft. forward and 28 ft. aft—without stores and crew.

Dimensions.

Propelling machinery.

"The propelling engines, by Messrs. Maudslay, Sons and Field, are contracted to develop 12,000 horses under forced draught, and 7500 under natural draught, and are expected to indicate a mean of 4750 on a continuous sea-going run of 96 hours, with open stokeholds. Under these conditions the ship is estimated to realise a speed of 17 knots, 16 knots, and 13·75 knots respectively. The amount of coal carried at the load draught is 900 tons, which, it is calculated, will give a radius of action of 4900 knots at a speed of 10 knots. The engines consist of two sets of the triple-expansion type, with inverted cylinders. The high-pressure cylinder has a diameter of 43 in., while that of the intermediate cylinder is 62 in., and of the low-pressure cylinder 96 in., with a stroke of 51 in. Each cylinder is supported upon four cast-steel columns, the slipper guides for the cross-heads being bolted to cast-steel standards. The frames of the engines are also constructed of cast steel; the high-pressure cylinders are fitted with piston valves, and the others with double-ported slide valves. The valves are worked by link motion and double eccentrics, the valve gear being so arranged that each cylinder can be linked up separately for working expansively. The surface condensers, which are made entirely of brass, contain 7642 horizontal tubes of the same metal, 10 ft. long, with an external diameter of $\frac{3}{4}$ in., and giving a cooling surface of 15,000 square feet. A couple of inclined air pumps, actuated from the piston rod-heads of the intermediate and low-pressure cylinders, are provided to each set of engines. Steam is furnished by six single-ended cylindrical boilers, 10 ft. 3 in. long and 16 ft. in diameter. They are wholly made of Siemens-Martin steel, and contain in all 24 corrugated furnaces, 7 ft. 5 in. long, with

Boilers.

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a mean diameter of 3 ft. 4½ in., and affording a total area of grate surface amounting to 604 square feet. The boilers contain 3564 steel tubes, 7 ft. 5 in. long by 2½ in. in diameter, giving a total tube surface of 17,040 square feet, and an aggregate of 19,380 square feet of heating surface. The ship is propelled by four-bladed screws, having a diameter of 16 ft. 6 in., and a mean pitch of 21 ft. 3 in., and which worked so well that the absence of vibration was one of the noticeable features of the trials.

Natural draught trial.

"The four hours' run with open stokeholds was made with very satisfactory results. As previously stated, the specified indicated horse-power with natural draught is 7500, but the result of the half-hourly observations gave a mean collective power of 9074, the starboard and port engines developing 4612 and 4462 horses respectively. The *maximum* power indicated at any time was 10,112. Speed was not taken.

Forced draught trial.

"In the testing of powerful machinery more particularly, the run with open stokeholds is regarded as little more than a preliminary spin by way of preparation for the crucial trial with forced draught. The trial under this condition was made two days after the natural draught trial. The Nile, after considerable delay, caused by defective anchor gear, got under way from the anchorage, and the engines having in the meantime attained the requisite number of revolutions, the first half-hourly observations were taken, and they were continued to the end without a break occurring. Everything contributed to the success of the trial. A light breeze blew on the beam; the sea was smooth, and both the stokers and the coal (Harris's deep navigation) were picked. The following is the tabulated results of the four hours:—

Boiler Pressure.	Revolutions.		Vacuum.		Indicated Horse-power.
	Starboard.	Port.	Starboard.	Port.	
128	94·33	93·63	29	26¼	11,994
133	94·80	93·46	29	26½	12,112
131½	93·36	92·46	26	26¼	12,013
134	93·60	92·80	26	26½	11,900
135	94·33	93·40	26	26½	12,362
134½	93·16	92·66	26	26½	12,087
132½	94·36	92·33	26	26½	12,096
134	94·40	93·80	26	26½	12,256

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Results.

"When worked out the above *data* gave the following means:—Steam in boilers, 132·80 lb.; vacuum, 26 and 26·4 in.; revolutions, 94·04 and 93·13; I.H.P., 1744 and 1756 (high), 2252 and 2091 (intermediate), and 2147 and 2112 (low); starboard, 6143; port, 5959; giving a collective indicated horse-power of 12,102, with an average air-pressure in the stokeholds of 1·82 in. A couple of runs on the measured mile showed a mean speed of 16·88 knots, while subsequent distance measurements outside the Warner gave 17 knots. Steam continued to blow off throughout the trial, and, as will be seen from the returns, the uniformity of the steaming was remarkable. The falling off during the fourth half-hour was due to the turnings on the measured mile, and as soon as the Nile was taken out to sea the power at once rose. The engines were stopped and started in 14 seconds. Although the wind only blew with a force of from 3 to 4, and there was not sufficient sea to lift the ship, the forward deck was always awash, and when the ship was steaming down Channel clouds of spray broke over the turret."

Gunnery trials of Howe.

The Howe, first-class battle-ship, had her gunnery trials on the 14th May, 1890. The Howe belongs to the Admiral class. She was designed by Sir Nathaniel Barnaby, K.C.B., was launched at Pembroke on 29th April, 1885, and was brought round to Portsmouth in the following November for the purpose of undergoing her official trials, and being made ready for sea. The great delay which has taken place in her completion has been entirely due to the difficulty experienced in the supply of her barbette guns. The Howe has a displacement of 10,300 tons, and is protected by armour 18 in. thick at the water-line, over 150 ft. of her extreme length of 330 ft. She is provided by Messrs. Humphrys, Tennant & Co., with two sets of compound vertical three-cylinder engines.

Turret *v.* barbette.

The *Times* remarks, in the report of the trials, that Naval opinion continues divided on the question of mounting big guns; and, so far as can at present be perceived, there is no probability of the relative merits of turrets and barbettes being finally determined. Each system finds warm supporters; and, as the special advantages attaching to each cannot be combined, it would appear that the question whether a new battle-ship is to carry its guns with the superior protection afforded by a turret or with the superior elevation and depression afforded by a barbette mounting will largely depend upon the personal preference which happens to dominate at the Admiralty at the time it is designed. Throughout the construction of the Admirals the French system was frankly and steadfastly accepted; but in the battle-ships Trafalgar and Nile, subsequently laid down, not only was the

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armoured protection greatly extended, but the principle of revolving turrets was reverted to. It might, therefore, have been supposed that the balance of advantages had been ultimately determined in favour of the latter. This, however, is not the case. So far from their having arrived at a final judgment on the side of turrets, the Admiralty have in the case of the new battle-ships of 14,150 tons displacement, given a decided preference to barbettes.

Barbettes

In the Howe the parapet of the barbettes is about 20 ft. above the water-line and 10 ft. above the weather deck, while the axis of the guns of the Trafalgar, when run out for horizontal fire, is not more than 3 ft. 9 in. above the plane of the deck and 15 ft. above the water. The barbettes are built in a line with the keel at each extremity of the battery containing the auxiliary armament of 6-in. breechloaders. They are pear-shaped in plan, and the walls are made to incline at an angle of 60 deg. The normal thickness of the armour is 14 in., except at the sides nearest the centre of the ship, where it is reduced to 12 in. Each barbette contains a pair of 67-ton 13½-in. breechloading guns, which carry an armour-piercing projectile of 1250 lb. weight, capable of penetrating a steel plate of 24·3 in. in thickness at a range of 1000 yards, with a bursting charge of 85 lb. in the common shell. As the barbettes are outside the limit of vertical protection, the ammunition is conveyed from the magazines to the guns by means of armoured trunks 12 in. in thickness. The gunners are protected against the fire of machine-guns stationed in an enemy's tops by a shot-proof cupola, and against the bursting of shell immediately below them by a 3-in. steel floor. It only remains to be added that, while the ballistic power of the guns now carried is more than is necessary to penetrate the thickest armour afloat, and their inertia more than could be overcome by manual applications, any reduction in the weight of the gun for the simple purpose of getting rid of mechanical agencies in their working would entail the employment of numerically strong gun detachments with corresponding exposure and human risks.

Trials of auxiliary armament.

The weather on the day of the trial was very fine, and the sea smooth, as the ship proceeded outside of the Nab for the trial of the large guns; advantage was taken of the interval to test the mountings of the auxiliary armament. These comprise six 6-in. guns, twelve 6-pounders, and seven 3-pounder Hotchkiss quick-firers mounted on stands, and a complement of five barrelled machine-guns. The 6-in. guns were each tested with a couple of rounds—a full charge of 48 lb. and a reduced charge of E. B. E. powder, the

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projectile in every case weighing 100 lb. The reduced charges were fired horizontally, while the full charges were given elevations of from 10 deg. to 15 deg., but without any appreciable difference in the recoils, which only varied from 39 to 39½ in. In only one instance was any difficulty experienced with the breech mechanism, a slight jam occurring in consequence of the threads of the breech-block getting choked. While the second gun was being tried an accident occurred to the captain of the detachment. He appears to have pulled the lanyard prematurely, while the piece was being cocked, and upon recoil the breech lever struck him in the face, severely injuring his nose. One of the Nordenfelts gave a little trouble, but the defect was remedied in the course of the day. The trials of the secondary armament having been completed, the important business of the day was proceeded with—viz., the testing of the gun mountings and firing gear connected with the 78-ton guns in the two barbettes.

The following was the actual programme of firing:—

FORE-BARBETTE.

Gun.	Charge.	Bearing.	Elevation.	Recoil.
				Inches.
Right . .	472½	Starboard beam	Horizontal	31
Left . .	472½	30 deg. before starboard beam .	5 deg.	32
Right . .	472½	15 deg. before port beam . . .	10 deg.	32
Left . .	472½	15 deg. before port beam . . .	10 deg.	32
Right . .	630	Port beam	Extreme depression	46½
Left . .	630	30 deg. before port beam . . .	8 deg.	51
Right . .	630	10 deg. before port beam . . .	Extreme	54
Left . .	630	10 deg. before port beam . . .	Extreme	53½

AFTER-BARBETTE.

Right . .	472½	Starboard beam.	Horizontal	30
Left . .	472½	32 deg. abaft starboard beam .	5 deg.	29
Right . .	472½	15 deg. abaft port beam . . .	10 deg.	32
Left . .	472½	15 deg. abaft port beam . . .	10 deg.	32
Right . .	630	30 deg. abaft port beam . . .	8 deg.	52
Left . .	630	Port beam	Extreme depression	42½
Right . .	630	15 deg. abaft starboard beam . .	Extreme	51½
Left . .	630	15 deg. abaft starboard beam . .	Extreme	51½

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Hydraulic arrangements.

The general hydraulic arrangements are substantially the same as those in the Trafalgar. Instead, however, of the working pressure in the pipes being as high as 1000 lb. to the square inch, it has been reduced in the Howe to 800 lb. The recoil presses are also at present without the disconnecting valves in the rear which were found so effective in the Trafalgar, though they will probably be supplied subsequently. The pistons are fitted with what is technically known as the limited lift valve. At the trial the ordinary recoil valves were loaded to 2700 lb., and as the special valves mentioned were loaded at 100 lb. less, the water on the recoil of the gun is forced through the latter into the annular spaces round the piston, thereby reducing the pressure in the presses by the amount of the difference. The first part of the programme passed off without noteworthy incident. After the second round had been fired it was discovered that the cut off slides had been forced out of place; but as the purpose of this fitting was only to prevent the gun from jarring violently against the buffer on being run out for firing, all that was required to be done in the emergency was to run it out with more care. It was arranged to discharge from each barbette two rounds simultaneously with reduced charges, and the same number simultaneously with full charges. Owing, however, to a misfire from the left gun in the fore barbette, rounds three and four were fired independently. It was remarkable that, though the fuse acted, the charge, being apparently rammed too far home, failed to ignite. After the last simultaneous rounds had been disposed of, an experiment was tried with the object of determining the least pressure necessary for opening the breach after firing. Notwithstanding the work which had been performed and the consequent fouling of the mechanism, it was found that 460 lb. to the square inch was adequate for the purpose. The considerable margin of power thus found to exist will be taken advantage of in the hydraulic arrangements of future ships. The time taken to run the guns out was 30 secs.

No damage sustained by ship.

No damage was sustained by the ship beyond unimportant breakages. The height of the guns above the plane of the deck, and the fact that when firing on the beam their muzzles protrude over the sides, will go far to explain this immunity from casualties. But, as will be noticed, the firing was directed neither ahead nor astern. In the Trafalgar's trials the Director of Naval Construction insisted upon the guns being fired immediately over the deck, with the object of ascertaining the actual injury which the ship might sustain from the concussion. The result was so satisfactory that no further experiments in the same direction were deemed necessary.

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Thunderer. Trials of the new armament.

The turret ship Thunderer made a trial of her new armament at the back of the Isle of Wight, on the 6th January, 1891. In addition to undergoing a thorough repair in the hull and being refitted with a new flying deck, she has been provided with a set of modern triple-expansion engines by Messrs. Maudslay, Sons & Field, capable of developing 7000 horses under forced draught, in place of the old simple engines, whose *maximum* horse-power was 6270. An even more important improvement has taken place in her armament, which is described in Part III. The total cost of the repair, refit with new machinery and rearmament, is £148,194, which includes a sum of £13,842 for indirect charges.

Steam trials of Achilles after refit.

The Achilles, ironclad-ship, was taken outside Plymouth Breakwater on the 21st January, 1891, for a six hours' trial of her engines. Her gun trials were carried out simultaneously. The vessel's ten boilers have been renewed, but are replaced with others of an equally obsolete type, six of which can only withstand a pressure of 25 lb., whilst the remaining four can be worked to 30 lb. This is due to the fact that the ship is supplied with simple engines of an old pattern manufactured in 1864 by Messrs. Penn. Four of the boilers are eighteen years old, and the pressure has consequently been reduced to a minimum. The most important alteration in the vessel's armament has been the addition of two 6-in. breech-loader guns on the upper deck, whilst eight 3-pounder quick-firing and 16 machine guns have also been supplied. The main battery still consists of fourteen 12-ton muzzle-loading guns. The gun-trials, held with the object of testing the mountings, were entirely satisfactory, but the steam trial was less successful, as, after only 3½ hours, the Achilles was obliged to return to the Sound, owing to the slacking back of the after gudgeon. The mean indicated horse-power was 4750. In view of the trifling nature of the defect, the officials have asked permission to be allowed to accept the vessel without further experiments.

1st-class cruisers.

We now come to the first-class cruisers of the Edgar class. The first of the class—the Edgar—was launched at Devonport in November, 1890, the Royal Arthur (formerly the Centaur) was launched at Portsmouth in the presence of Her Majesty on the 26th February, 1891, and the Hawke is now nearly ready for launching at Chatham. The *Times*, in describing the launch of the Royal Arthur, remarks that the keel-plate was laid down on the 20th of January, 1890; and when it is stated that, of the 4400 tons of weight which are absorbed by the shell alone, 2600 tons have been actually worked into the ship, it will be seen that she has been advanced

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with remarkable rapidity. The Royal Arthur and the Crescent (which is also under construction at Portsmouth) differ slightly from the rest of the class. When the former was well advanced, progress at the bow was arrested, with a view to modifications being introduced, and it was finally determined, and wisely, to add a top-gallant-forecastle to the two ships, and to make a trifling change in the bow armament given later on.

Qualities of type.

As was stated by Lord George Hamilton, this vessel may be described as an enlarged Mersey or a diminished Blake, having a smaller coal-endurance than the latter, and being intended to steam at a somewhat lower rate of speed. Designed for isolated service at sea, she embodies all the essentials required in a vessel of the kind, possessing, as she does, good speed (19½ knots under forced draught), fair coal capacity, great powers of offence and defence against all comers, large boat complement, ability to keep the sea for a long period without having to be docked (through being sheathed and coppered), and excellent manœuvring handiness.

Dimensions.

The Royal Arthur measures 360 ft. between perpendiculars and 60 ft. 8 in. in beam, with a mean draught of 24 ft. 9 in. and a load displacement, when fully equipped for sea, of 7700 tons. With the exception of the Royal Sovereign, she is the longest ship ever launched from Portsmouth dockyard, her stem and stern projecting far beyond the ends of the slip on which she was constructed. In fact, it may be said that the size of the new class of vessels is the special feature which distinguishes them from previous fast cruisers. The importance of length combined with moderate beam as a factor of speed is now generally recognised. As Mr. White has observed, the possibility of any vessel continuing to fight and maintain speed at sea depend largely upon her length and size as well as upon her freeboard and the disposition of her armament. It has, indeed, been suggested that war cruisers should be built equalling in length the City of Paris and other ocean greyhounds; but, as the Director of Naval Construction has pointed out, "one may well hesitate in embarking on such a course so long as we possess not merely a vast superiority in swift merchant steamers available as auxiliaries to the regular fleet, but also longer war cruisers than are to be found in foreign navies." A reasonable length is of special consequence in cruisers like the Royal Arthur, which are designed to keep the sea and to act independently, seeing that the larger ship feels the increased resistance of the water to her speed less than the smaller ship, and may be capable of overtaking and running down the latter at sea, although incapable of doing so in smooth water.

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Though smaller than the Blake and Blenheim, the Royal Arthur is of superior dimensions to the Inconstant, launched in 1868, which, until the laying down of the Blake, remained the longest unarmoured fighting ship in the service. (See Pl. 15, Part II. of this volume.)

Construction. The new cruiser is built entirely of steel, with large phosphor-bronze castings for stem and stern posts, shaft brackets, &c., the form of the bow constituting a ram of formidable character. The double bottom, which runs throughout the ship and extends from the wing passages on each side, is constructed on the usual cellular bracket system, and is subdivided by the longitudinal and transverse framing into a great number of water-tight compartments, as a protection against under-water attack. The framing of the structure is of great strength, and is further strengthened by cross-bracing.

Armour protection. Careful attention was bestowed upon the question of the protection of the ships and their guns and gun crews. It was open to the Admiralty to propose to belt them after the manner of the Galateas, or to combine with the defence of the water-line a thin armoured protection for the broadside guns. In the end it was decided to build a strong protective deck over the vitals, in association with "certain novel arrangements" for protecting the guns and their crews from shell fire. Although, therefore, the Royal Arthur has been entirely deprived of vertical armour, the vital portions, such as the engines and boilers, magazines, and steering gear, are protected by a steel deck of the ordinary turtle-back form, with sharp curves at the sides, and extending throughout the structure. It varies in thickness from an inch to a *maximum* of five inches in places most exposed to injury in action, and on top next the skin of the ship are placed broad coal bunkers, which afford supplementary defence against shot and shell. In consequence, however, of the great height of the engines, which renders it impracticable to keep them below the steel-deck, the cylinders (which are in the vicinity of the water-line) are efficiently protected on both sides by sloping armoured combings 6 in. in thickness.

Protection of gun crews. The protection of the guns and gun crews consists of casements with screens in front, which move with the training of the guns and are of the thickness of 6 in., which is supposed to be amply sufficient to prevent the bursting of shell inside. Inboard the gunners stand within an iron box 2 in. in thickness, through the floor of which the shot and ammunition are served, by means of tubes, with great ease and rapidity. The ship is also fitted with an armoured conning tower forward, 12 in. thick, from which in action the engines, steering gear, and guns can be directed. She will be ventilated by

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both natural and artificial means, and will be lighted electrically throughout. Four search lights will be provided, worked by machinery under cover of the steel deck. Auxiliary means of illumination will also be supplied. Among other fittings are steam hoists for getting the boats (which are the same as in a first-class battle-ship) freely in and out.

Armament. The Royal Arthur will carry the following armament:—One 9·2-in. gun (carried on central pivot mounting aft), twelve 6-in. quick-firing guns, twelve 6-pounder, five 3-pounder quick-firers, six machine guns, and two 9-pounders—a remarkable armament for a cruiser. In addition to the above the ship is fitted with four torpedo tubes of the latest design, two submerged and two above water, with a complement of eighteen torpedoes. A complete system of net defence will be supplied as a safeguard against torpedo attack, in conjunction with the employment of her own torpedo guns and boats.

Machinery. The ship is fitted with twin screws and a balanced rudder (worked either by steam or hand), her high speed requiring this special form of rudder to keep her under proper control. The engines will be supplied by Messrs. Maudslay, Sons and Field, of Lambeth. The contracted indicated horse-power is 10,000 horses with natural draught, and 12,000 with forced draught, which, it is estimated, will give a speed of 18½ and 19½ knots respectively. The amount of coal carried is 850 tons, which will enable the ship to steam continuously at a 10-knot speed over a radius of 10,000 knots, or 2800 knots at a speed of 18 knots. The engine and boiler rooms, which are divided by a longitudinal bulkhead, possess exceptional means of ventilation, and special facilities have been introduced, by means of sector ports, for coaling the ship. The complement of officers and men will be 520.

2nd-class cruisers. There are twenty-one second-class cruisers of the Apollo type built, building, or completing in the Royal Docks and by contract. These are represented in Pl. 3 of Part II., and they were described at page 167 in the *Naval Annual* for 1890. The advantages gained by the increased dimensions of the Astræa class have been mentioned in Chap. X.

3rd-class protected cruiser Pallas. The third-class protected cruiser Pallas, which was laid down on July 1, 1889, and was floated out of dock at Portsmouth on June 30, 1890, is the first of the ships built in the Dockyards under the Naval Defence Act. The sister ships are the Pearl, Philomel, and Phœbe, under construction at Pembroke and Devonport, and the five vessels completing for the defence of Australia. Being intended for service on stations where docking accommodation is available, the Pallas is

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without copper sheathing. She measures 260 ft. between perpendiculars, and has a breadth of 41 ft., a mean draught of 15 ft. 6 in., and a load displacement of 2575 tons. The weight of the hull is 1250 tons. A water-tight steel deck extends throughout the entire length of the ship, whereby protection is afforded to the engines, boilers, magazines, &c., and which is supplemented by the coal bunkers. The hull is largely subdivided by water-tight decks and bulkheads, so that a bilged compartment can be isolated at will. Special protection is provided for the fighting stations of the ship, as well as for the necessary instruments, telegraphs, &c., that would be required for manœuvring in action. The Pallas is to be provided by Messrs. Hawthorn, Leslie & Co., Newcastle-on-Tyne, with two sets of inverted direct-acting engines, for which steam at 155 lb. pressure will be supplied by four double-ended boilers. The indicated horse-power at natural draught is 4500 and with forced draught 7500, the speed resulting being estimated at 16½ knots and 19 knots respectively. The continuous sea-going speed to be maintained on a four days' run is specified to be 14¾ knots under a natural draught horse-power of 2500. The coal capacity at load draught will be 300 tons, which, on the assumption that the speed will be limited to 10 knots, will insure the vessel a radius of action of not less than 4800 knots. The armament of the Pallas will consist of eight 4·7-in. and the same number of 3-pounder quick-firing guns, in addition to smaller machine guns and the usual torpedo equipment. The total cost of the ship, including propelling machinery and exclusive of the armament, is £147,864.

Hydraulic boat-hoisting gear in Vulcan.

The *Times* of the 20th January, 1891 states:

"During the past few days there have been carried out on board the Vulcan, at Portsmouth, a series of trials of hydraulic boat-hoisting machinery, supplied by Sir W. G. Armstrong & Co., of Elswick, which have attracted more than ordinary interests in consequence of the novelty of the fittings introduced for the first time in a ship. Chief among these is a pair of enormous "goose-neck" cranes, placed one on each side of the deck, almost amidships, and which present to a seaman's eye a most ungainly appearance. These cranes are, in fact, huge davits, whose total height is 65 ft., with an overhang of 38 ft. It will be readily understood that a bent beam of these dimensions, and weighing about 27 tons, requires special arrangements for its support and security. To provide these, about 30 ft. of the total height lies buried in the hold, passing down through the upper, main, and protective decks to the bottom of the ship, where the foot rests upon a special steel casting bolted to

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the structure of the vessel. In the upper deck is secured a heavy steel ring or socket, which takes all the canting or capsizing strains, and in which the crane rotates. The beams themselves are built of steel plates and angles on the box-girder principle, but specially strengthened and stiffened. By this method of construction the lifting machinery is permitted to be erected within the pillar of the crane, well down in the hold, and consequently protected from gunfire, while the portion above the protective deck is screened by an armoured tube. The lifting machinery consists mainly of two cylinders of 17½ in. and 5½ in. diameters fitted with rams, which have a vertical travel or stroke of 10 ft. The small cylinder plays a very important part in the working of the mechanism. Both rams are rigidly attached at their upper ends to a huge crosshead which carries four sheaves on a pin at right-angles to the axis of the cylinder. At the lower end of the cylinders are four sheaves corresponding in vertical line with those above, the whole thus forming a system of pulleys differing from the ordinary system in the fact that an enormous power is required to push the pulleys apart, and so be able to lift a comparatively small weight of 20 tons or so. The thrust exerted on the crossheads by the rams at the ordinary working pressure of 1000 lb. per square inch is about 118 tons, one-fourth of which only is available for lifting purposes, owing to the multiplying power of the pulleys, which increases the 10 ft. stroke to a lift of 40 ft. The ropes, 5½ in. in circumference, are of steel wire, and of such strength and tenacity that a direct fall of 90 tons failed to fracture them. The most interesting features in the mechanism, and one for which a patent has been obtained by the firm, is the attachment of the small cylinder already mentioned, the special duty of which is to hold and keep taut the slings after they have been hooked on until a favourable moment for hoisting the boat presents itself. This is of the utmost importance in a seaway as a preventive against accidents. The arrangement of valves is such that the main lifting power cannot be applied until the small cylinder has been brought into action. It also provides for the escape of the water when the ram is driven back by the falling of the boat.

Lifting machinery.

"The turning or slewing motion of the cranes is effected by means of two cylinders fitted with rams 16 in. in diameter, and having a direct thrusting force of 90 tons. These are placed vertically alongside the pillar of the crane, and the rotary motion is given by admitting the pressure to one or other of the presses. The cranes have a turning range of 250 deg., which will enable a boat to be picked up from alongside the ship and deposited in almost any

Gear for revolving the cranes.

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position on deck. It is, however, obvious that, since the Vulcan is 58 ft. wide, and the cranes are 40 ft. apart, it would be impossible, without special devices, to lift a boat remotely situated from the part where the crane is fixed. In order, therefore, to provide for the contingency of one of the cranes becoming disabled in action or by accident, the torpedo-boats (of which the ship carries six) are stowed in crutches fitted on trolleys actuated by worm gearing and moving upon rails, by which means they can be conveyed from one side of the ship to the other."

Cranes tested.

"The cranes have been subjected to two tests. The first test consisted in hoisting the full working load of 20 tons through a lift of 40 ft. at the rate of 90 ft. per minute, traversing it through the entire range at a speed of 45 ft. per minute, and lowering the load. The load was next increased to 25 tons, and it is intended eventually to increase the weight to 40 tons, or double the ordinary working load, when the ship is further advanced, before the gear is accepted from the contractors. Every part of the machinery successfully withstood the tests, the droop being inconsiderable and the permanent set about an inch."

Derrick.

"The service derrick attached to the mainmast for boat-hoisting purposes has also been fitted with hydraulic machinery. In this case the working load is 10 tons, and the tests consisted in lifting this weight through the full lift of 25 ft. from the water-level at a rate of 90 ft. per minute, topping the derrick with the load on at 20 ft. per minute, and slewing it into position with the bollards. The derrick was also required to hold, top, turn into position, and lower a load of 20 tons in order to test the endurance of all the parts. The lifting machinery only was supplied by the contractors in this case, the derrick and its fittings having been manufactured by the ship contractors."

FRANCE.

1st-class battle-ships.

The *Yacht* states that the Minister of Marine has approved of the design of a first-class battle-ship to be named the Jauréguiberry, which is to be built by contract at the Forges et Chantiers Company's Yard at La Seyne, near Toulon. The ship has been designed by M. Lagane, the chief engineer at the Company's works.

The principal dimensions are:—

Length	356 ft.
Breadth	72 „ 8 in.
Extreme draught of water	27 „ 9 „
Displacement	11,818 tons.
Horse-power of engines, natural draught	13,275.
Corresponding speed	17 knots.

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The ship will have an armoured belt, the maximum thickness of which is 17¾ in., an armoured deck 2¾ in. thick, and a coffer-dam with 4 in. of steel in front of it.

The armament consists of—

2 30-cm. and 2 27-cm. breech-loading guns.
8 14-cm. guns.
4 65-mm.; 12 47-mm. guns.
8 37-mm. quick-firing guns.
6 torpedo launching-tubes.

There are four turrets for the principal armament, each of them containing one gun, and protected by 14½-in. armour. There are also four turrets for the 14-cm. guns—two guns in each—and they are each protected with 4-in armour. The turrets are of the ordinary description, and are fitted so as to be turned either by electricity or by hand.

The designer has arranged that electricity shall be used generally for the work on board ship and not only for lighting purposes. The trial will be most interesting, as in this case the usual cumbrous hydraulic gear will be unnecessary.

Tréhouart class.

The four ships of the Tréhouart class are all from the designs of M. de Bussy. They are of an improved Furieux type. The Tréhouart is building in the dockyard at Lorient, and the other three by contract, the Bouvines building at La Seyne, and the Jemmapes and Valmy by the Société de la Loire at St. Nazaire. Their principal dimensions and other particulars are given in the list of French armoured ships in Part II. of this volume. These ships, at first called battle-ships, are really coast-defence ships of a powerful type. They are all identical in respect to hull, armour and armament; but in regard to propelling machinery they will differ in some respects—free scope being given to the several marine engineers to obtain the best result. The machinery of the Tréhouart will be manufactured at the Government factory at Indret, and the boilers will be of the Belleville type. The machinery of the other ships will be manufactured by the contractors for the hulls, and the boilers will be multitubular of the Lagrafel and Allest type.

Armament.

The armament is composed of two 34-cm. B.-L. guns, four 10-cm., four 47-mm., and four 37-mm. quick-firing guns, and two torpedo launching-tubes. The 34-cm. guns are of new pattern, and are 42 calibres in length. The velocity at the muzzle is 2624 ft. per second. Each of these guns is placed in a separate turret, supported on a fixed tower or redoubt, inside which the turning gear is placed. Both turrets are at the middle line, one forward, and the other abaft. Each fixed tower is composed of an armoured ring resting on the

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armoured deck; inside the armoured ring converging brackets support the turret. The armour on the turret is 17¾ in. thick, and that on the fixed tower is 15¾ in.

The short deck-house between the two turrets contains the four 10-cm. quick-firing guns; these guns are protected by steel shields 3 in. thick. The four 47-mm. guns are, it is understood, to be placed in the lower military top of the one mast with which the ship will be fitted.

The torpedo launching-tubes are placed on the armoured deck abreast of the after funnel.

Construction of hull. The hull is to be built of mild steel, and the stem, stern port, and shaft brackets are castings of the same kind of material. Each ship will have a double bottom; ten transverse and two longitudinal water-tight bulkheads extending up to the armoured deck. There is a belt of armour of a maximum thickness of 18 in. from end to end of the ship. The plates to be steel or compound, and to be in one depth.

Armour. The deck armour is to be of mild steel 2¾ in. thick in the flat and 4 in. on the slopes. The hatchways on this deck to the machinery spaces are to be of armour 12 to 16 in. thick, and they will rise to a height of 16 in. to 2 ft. above the deck.

Propelling machinery. The propelling machinery is to develop 7500 horse-power, with natural draught for a period of eight hours, with a coal consumption of not more than 2·2 lb. per horse-power per hour. It is expected that the speed under these conditions will be 16 knots per hour, and the number of revolutions per minute 110. With forced draught in a trial of two hours the horse-power is to be 8400, with a consumption of 30¾ lb. of coal per square foot of fire grate. The engines are of the horizontal triple-expansion type, and the length of stroke is 39⅜ in. The propellers are three-bladed, and of manganese bronze.

2nd-class cruisers. The two new second-class protected cruisers recently laid down in the dockyards, the Chasseloup-Labat at Cherbourg, and the Bugeaud at Toulon, nearly resemble the Souchet now approaching completion. The dimensions and other particulars are as follows:—

Length	308 ft.
Breadth	43 „ 6 in.
Extreme draught of water	20 „ 10 „
Displacement	3712 tons.
Horse-power of engines	9000.
Estimated speed	19½ knots.

The armament consists of six 16-cm., four 10-cm., eight 47-mm., and twelve 37-mm. quick-firing guns, and six torpedo launching-tubes.

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The protective steel deck will be 1¼-in. thick on the flat and 3 in. on the slopes.

Submarine boats.

In writing of submarine boats the *United Service Gazette* considers that the development of quick-firing guns brought about by the increase in the offensive and defensive power of swift torpedo-boats threatens ere long to completely abolish the use of surface torpedo-boats in marine warfare, unless the latter can be rendered proof against those terribly destructive weapons, the new rapid-firing guns of large calibre. To secure this invulnerability by the aid of armour would destroy the speed and handiness of the torpedo-boats, and it has long been the opinion amongst many naval officers, more especially on the Continent and in America, that, if the torpedo is to be used for successful attack, it will have to be discharged from a vessel which is rendered invulnerable by being totally submerged, that is to say, from a submarine torpedo-boat.

Trials of Peral.

Recently the foreign press have been commenting very favourably on the trials of the Spanish submarine torpedo-boat Peral and the French boats Gymnote and Goubet. We are told that, in Cadiz Bay, the Peral successfully proceeded some two or three miles to sea, and, after running a long distance under water, succeeded in blowing up an old hull. The Gymnote, in the roadstead of Toulon, was able to keep under water at a depth of about eight feet, and, by means of the gyroscope, to steer a given course with mathematical precision, the distance being calculated from the number of revolutions of the screw. Painted in grey, this boat is quite invisible when sunk below the surface.

Gymnote.

Goubet.

But, according to *La Marine Française*, the most successful submarine boat yet built is the Goubet, named after its inventor, who was formerly employed to design submarine boats for the Russian Admiralty. The speed, however, is slow, being only between five and six knots, whilst other submarine boats—notably the Nordenfelt—have attained a speed of twelve and a half knots. The electrical motive power of the Goubet is supplemented by two oars, one projecting from each side; these pass through water-tight collars in the hull, and are worked by one of the crew, who sits aft, when the boat gets near the enemy's ship. Two other oars, forward, are used for steering while the boat is being rowed. At other times the boat is driven by an articulated screw fixed to the end of the crank shaft by a special Goubet joint. This joint allows the screw propeller to take up any position whilst revolving, and the screw serves both as propeller and rudder. The lower part of the hull is arranged for water ballast, and has a heavy lead

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keel, which is detachable from the inside in case of emergency, so that the boat can come readily to the surface if anything should go wrong with the air-pumps or valves. Communication with the exterior is maintained by a telephone, and messages, enclosed in glass balls, can also be sent out and received through a pneumatic tube. The most valuable characteristic of the Goubet is her perfect stability. Whether she is above or below water she is always in equilibrium; the vessel can ascend or descend vertically with great rapidity by the slightest modification of the water ballast, and remains absolutely stationary as soon as the ballast ceases to be let in or discharged. The force required for propulsion is very slight, and she can be manœuvred with ease by a single roller. If she strikes against an obstacle she simply rebounds without injuring herself. In addition to using her torpedoes, she can be utilised for fouling the screw of a ship, and is provided for the purpose with a chain having two buoys at the ends. The experiments carried out at Cherbourg have proved the Goubet's capabilities as a submarine boat. She is habitable, steers well under water, and can pick up and cut mining cables and moorings with absolute precision, and seems fully to come up to the essentials laid down for a submarine boat, including invisibility.

Value of submarine boats.

A vessel possessing all these powers of offence would most likely, in spite of her low speed, prove very effective when used in harbours or roadsteads against the ironclads of an enemy, notwithstanding the difficulty there would always be of seeing through water and keeping the look-out glasses free from moisture. If we turn to the naval records of the American Civil War, we find positive proof of the destruction a few determined men could even then accomplish with the rough materials and crude designs in submarine vessels at their disposal.

Experiments in England.

In case of a future naval war there will not be wanting brave men willing to risk their lives in these novel and uncanny vessels, if by so doing they can serve the interests of their country. Experiments in English waters with submarine boats have not proved satisfactory, notably with the one that stuck in the mud at the bottom of Tilbury Dock; but, although Lord George Hamilton raised a laugh when describing this trial in the House of Commons, we think it is satisfactory to note that the question of submarine torpedo-boats is receiving a due amount of attention and consideration at the hands of the Admiralty.

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SPAIN.

Armoured cruisers.

Three armour-belted cruisers, the Infanta Maria Teresa, the Vizcaya, and the Almirante Oquendo, are being built and completed by Sir Charles Palmer's Anglo-Spanish Company, at Bilbao. The first named was launched in August, 1890.

The following are the dimensions and other particulars of the ship:—

Length between perpendiculars	340 ft.
Breadth	65 „
Mean draught of water	21 „ 6 in.
Displacement	7000 tons.

Armour.

The hulls are built of mild steel, and are well subdivided by double bottom and water-tight bulkheads. They have a belt of armour 12 in. thick, extending from 4 ft. below the water-line to 18 in. above it. The conning tower, containing the compasses, telegraphs and voice tubes, is also protected by 12-in. steel-faced armour. There is a protective steel deck from end to end of the ship. This deck is 2 in. thick on the flat, and 3 in. on the sloping portion.

Machinery.

The engines are triple expansion for twin screws. The power developed under forced draught will be 13,000 horses, and with natural draught 9000 horses. The speeds corresponding will be 20 knots and 18 knots.

Armament.

The armament consists of—

2 28-cm. Hontoria B.L.R. guns in barbettes.
10 14-cm. guns of the same description.
8 57-mm. quick-firing Nordenfelt guns.
8 37-mm. „ „ Hotchkiss guns.
8 torpedo launching-tubes, 6 above water, and 2 submerged.

The 28-cm. guns are mounted in two barbettes, protected with compound armour 10½ in. thick. The pumping and ventilating arrangements are most complete, and the lighting will be throughout by electricity, there being 400 incandescent lamps provided. There will be 3 search lights, each of 20,000 candle power.

UNITED STATES.

Indiana, Massachusetts and Oregon.

The most important ships of the new American Programme are the three sister coast-line battle-ships, Indiana, Massachusetts and the Oregon. Two of them are to be built by contract by Messrs. Cramp, of Philadelphia, and the other at the Union Ironworks at San Francisco.

They were fully described by Mr. Biles, in his valuable paper

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read at the Institution of Naval Architects in March, 1891. The following are their leading particulars:—

Length between perpendiculars	348 ft.
Breadth	69¼ „
Mean draught	24 „
Displacement	10,298 tons.
Indicated horse-power	9000.
Speed	16·2 knots.

Armament. The armament will consist of four 13-in., eight 8-in., and four 6-in. breech-loading guns, and twenty-eight small quick-firing and machine guns.

There is a belt of armour 196 ft. in length, and 18 in. in thickness. Above the 18-in. belt there is a 5-in. belt, as in our latest battleships.

Protection of armament. The four large guns are carried in two turrets, which have inclined armour 17 in. thick, the horizontal thickness being 20 in. The bases of the turrets are protected by redoubts having armour 17 in. thick, and extending from the top of the armour-belt to 3½ ft. above the main deck. The guns can be loaded in any position.

The 8-in. guns are also mounted in turrets, two guns in each. These turrets are formed of inclined armour 8½ in. to 6 in. thick, which corresponds to a horizontal thickness of from 10 in. to 7 in. These turrets are placed on a deck above the level of the heavy guns.

The four 6-in. guns are protected by 5-in. armour, and there is a 2-in. splinter bulkhead worked round the deck, the ammunition being passed up inside these bulkheads.

The conning-tower armour is 10 in. thick. The steel deck over the armour-belt is 2¾ in. thick, and the under-water deck at the extremities is 3 in. thick. The axis of the 13-in. guns is 17 ft. 8 in. above the water, and 6 ft. above the deck over which the guns fire. The 8-in. guns are 24 ft. 9 in. above the water, and the 6-in. guns 14 ft. 10 in. The 8-in. guns can fire over the heavy guns, and for considerable angles across the middle line of the ship. Each gun has its own magazine directly underneath it, below the armoured deck, and therefore protected by thick armour. There is, therefore, no need for the usual ready-use magazines in these ships in comparatively unprotected positions.

Coal supply. The coal supply at the designed load draught of water is 400 tons, but the bunkers will stow 1800 tons. With this large supply the ship will have a radius of action of 16,000 miles.

Mr. Biles, in the paper before referred to, describes the Monterey, now building, in the following terms:—

Monterey. "The Monterey is practically a low freeboard monitor. She has an

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armament of two 12-in. breech-loading guns in a barbette forward, and two 10-in. guns in a barbette aft. The foremost barbette has armour 14 in. thick, and the aftermost 11½ in. thick. The guns have 8-in. sloping shields over them. There is a complete belt of armour 4 ft. 6 in. wide and 13 in. thick, and a complete protective deck 3 in. deep. The armoured freeboard is 2½ ft. Besides the principal armament there are twelve small quick-firing guns. The horse-power of the engines is 5400, and the estimated speed is 16 knots."

Armoured cruiser New York.

The armoured cruiser New York is described as of a type coming between our cruisers of the Blake and Edgar classes. The principal dimensions and leading particulars are as follows:—

Length between perpendiculars	380 ft. 6 in.
Breadth	64 „ 10 „
Mean draught of water	23 „ 3½ „
Displacement	8150 tons.
Indicated horse-power	16,500
Speed	20 knots.

Protection.

There is a protective deck running the entire length of the ship. It is 1 ft. above the water amidships, and 4 ft. 9 in. below the water at the side. Amidships it is 3 in. thick on the flat and 6 in. thick on the slopes. At the extremities it is 2½ inches thick. There is also a belt of 5-in. armour on the sides in way of the machinery spaces extending from the protective deck up to the main deck. Behind the belt, which extends throughout the entire length of the ship, there is a cellular space which is to be filled with water-excluding material.

Armament.

The armament will consist of six 8-in. guns, two mounted forward in a barbette with 10-in. armour, two more mounted in a similar barbette aft, and one on each side of the upper deck amidships. The revolving shields on the guns are 7 in. thick. There are twelve 4-in., and sixteen smaller, quick-firing guns.

There are four torpedo launching-tubes, one forward, one aft, and one on each side amidships. The midship ones admit of training. The height of the axes of the 8-in. guns is no less than 25 ft. above the water, and the 4-in. guns are 16½ ft. above it.

The coal carried at the designed load draught is 750 tons; but the bunkers will stow 1500 tons. With the larger quantity the radius of action at 10 knots speed will be 13,500 knots.

"Commerce Destroyer."

Mr. Biles describes, in the paper before named, a remarkable vessel called a "Commerce Destroyer," popularly known as the "Pirate." She is a protected cruiser, and the following are some of her leading particulars:—

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Length between the perpendiculars	412 ft.
Breadth	58 „
Mean draught of water	24 „
Displacement	7475 tons.
Indicated horse-power	21,000.
Speed	21 knots.

Protection. The ship has a protective deck 2½ in. on the flat and 4 in. on the slope. The deck is 1 ft. above the water amidships and 4½ ft. below it at the sides. A cellular space, 5 ft. wide, will be formed inside the ship above the protective deck by a longitudinal bulkhead extending from end to end of the ship. In the way of the bunkers this space will be filled with patent fuel, and before and abaft this with water-excluding material.

Armament. The armament, which is a very light one, will consist of four 6-in. guns and eight 4-in. quick-firing guns, eighteen machine guns and six torpedo launching-tubes.

Abreast of the 4-in. guns there will be 4-in. steel armour, and to protect the machine guns 2-in. steel plates.

There are three sets of triple-expansion engines, and three screw propellers.

Coal-supply. The coal supply at the designed draught of water is 750 tons, but the bunkers will contain altogether 2000 tons. With this latter supply the radius of action at 10 knots speed will be 26,240 knots.

Argentine Republic.

25 de Mayo The Argentine cruiser, the 25th de Mayo, was built by Sir W. G. Armstrong, Mitchell & Co., and was designed by Mr. Philip Watts. She is 325 ft. long between the perpendiculars, 43 ft. broad, 16 ft. mean draught, and her load displacement is 3200 tons. Her contract powers with natural and forced draught were 8500 and 13,500 indicated horses respectively; and the contract speeds developed 20¾ and 22 knots. Her armament consists of—

2 21-cm. breech-loading guns.
8 12-cm. quick-firing guns.
12 3-pr. quick-firing guns.
12 1-pr. „ „
3 18-in. guns for torpedoes.

Her machinery, which lies wholly below the water-line, and is further protected by a strong steel armour deck, has been constructed by Messrs. Humphrys, Tennant & Co. The armour deck extends the whole length of the vessel and is provided with sloping sides, as is usual in this class of vessel. Over these slopes the plating is 3½ in. and 4½ in. thick, and the horizontal plates of the deck are

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1¾ in. thick. The armour deck is 1 ft. above the water line along its middle, and the principal hatchways are protected by 5-in. armour glacis plates and coffer-dams. Immediately above the armour deck, also extending the whole length of the ship, is a raft body 3 ft. deep along the midship portion, and of greater depth towards the extremities where the armour deck inclines downwards. Coal bunkers are constructed along the sides of the vessel above the armour deck, so as to form part of the raft body, and these and all the raft body spaces are very minutely subdivided by water-tight bulkheads. The normal supply of coal is 300 tons, but bunker capacity for 600 tons is provided.

Steam trials.

At the steam trials, runs with and against the tide were made at various speeds on the Admiralty measured mile at the mouth of the Tyne, and a curve of performance in terms of revolutions of screws constructed. The official trials included a run of six hours' duration with natural draught, and the mean speed was determined by taking the total number of revolutions of the screws, obtaining therefrom the mean number of revolutions per minute, and applying these to the curve of performance previously obtained; the actual performance was 21·237 knots per hour. The mean power developed over the six hours was 8700 indicated horses, and the mean number of revolutions 144·9 per minute.

Torpedo-boats.

The Argentine Government has recently added to its Navy 14 torpedo-boats, 6 being of the first-class and 8 of the second-class type. The first-class boats are 130 ft. long by 13 ft. 6 in. beam at the water-line. Five are fitted with triple-expansion engines, and on their official trial developed a mean speed of 23·312 knots. The last of these 6 boats has been fitted by Messrs. Yarrow, of Poplar—who constructed the whole of the 14 vessels—with quadruple-expansion engines with the view of testing the comparative merits of this type of machinery. The internal arrangement of these boats is very similar to that of the torpedo-boats last built by the same firm for the British Government. There are 11 water-tight compartments, and the skin plating of the hull is mild steel galvanized, but of greater thickness than is usual in this class of vessel. The fore part is protected by a turtle back, and the conning tower contains the steering wheel, which can be worked either by steam or by hand. The boilers in all of the boats are of the locomotive type, with copper fire-boxes and brass tubes. These boats are fitted with Yarrow's water-tight ashpan arrangement, which prevents the fire being extinguished by a sudden inrush of water from damage to the hull. The armament consists of one 18-in. bow torpedo tube for

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direct-ahead fire; two 18-in. tubes, placed aft, for side discharge; two 3-pounder quick-firing guns, and one double-barrelled 1-in. Nordenfelt gun. The chief point of interest in this boat is the introduction of quadruple-expansion engines, which have four inverted cylinders acting on four cranks on one shaft. The cylinders are respectively 14 in., 20 in., 27 in., and 36 in. diameter, by 16 in. stroke. The engines are placed in pairs, each pair having its cranks opposite one another, which arrangement balances the moving parts and reduces the vibration of the vessel. The official trial took place on November 13th, 1890. The results were an average speed of 24·453 knots on the measured mile, and an average speed of 24·4 knots on the two hours' continuous run. The average number of revolutions on the measured mile runs was 433 per minute, and on the two hours' run 432 per minute, the average steam pressure being 199 lbs. The average indicated horse-power of the five first-class boats with triple-expansion engines was 1120. The quadruple-expansion engines developed 1230 indicated horse-power, showing a gain of 110 horse-power, the consumption of fuel being the same. The trial was in every respect satisfactory, the manœuvring power being excellent. The small amount of vibration in this boat at cruising speeds as compared with that in many others is very noticeable, and is a point of importance as affecting the health of the crew, prolonged exposure to vibration having been found to produce nervous exhaustion.

In addition to the torpedo-boats named above, the Argentine Government has been provided with two first-class torpedo-boats of the Coureur type, built by Messrs. Thornycroft, of Chiswick.

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CHAPTER XIII.

Influence of Sea-power on History.*

Among the naval publications of the year, the work by Captain Mahan, of the United States Navy, on the 'Influence of Sea-power on History,' deserves particular notice. In an able review, the *Army and Navy Journal*, of New York, gives the following summary:—

Summary, *Army and Navy Journal*, of New York.

"The aim of this volume is to consider the principal elements affecting favourably and unfavourably the growth of sea-power in nations, illustrating them by special examples and by the experience of the past. The particular periods of history considered are those covered by the second Anglo-Dutch war, 1665–1667; war of England and France in alliance against the United Provinces, 1672–1674, and of France against combined Europe, 1674–1678; the English Revolution, 1688–1697; the war of the Spanish Succession, 1702–1713, and the succeeding contests with Spain, 1715–39; the Seven Years' War, 1756–63, and maritime warfare during the American Revolution. To this last, six of the fourteen chapters are devoted. Drawing from his historical *résumé* the professional lessons it teaches, Captain Mahan argues that 'the advance from the galley timidly creeping from port to port to the sailing ship launching out boldly to the ends of the earth, and from the latter to the steamship of our own time, has increased the scope and rapidity of naval operations without necessarily changing the principles which should direct them.'

Principles of war remain the same in spite of changes in weapons and tactics.

"It is as necessary now as it was in the days of Rodney, Drake and Nelson, of Rodgers, Macdonough and Chauncy, to get the weather gauge of the enemy; but this belongs in modern times to the ships that have the greatest speed. 'The battles of the past succeeded or failed according as they were fought in conformity with the principles of war; and the seaman who carefully studies the causes of success or failure will not only detect and gradually assimilate these principles, but will also acquire increased aptitude in applying them to the tactical use of the ships and weapons of his

* This chapter is a review of Captain Mahan's work.

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own day. He will observe also that changes of tactics have not only taken place *after* changes in weapons, which necessarily is the case, but that the interval between such changes has been unduly long. This doubtless arises from the fact that an improvement of weapons is due to the energy of one or two men, while changes in tactics have to overcome the inertia of a conservative class; but it is a great evil. It can be remedied only by a candid recognition of each change, by careful study of the powers and limitations of the new ship or weapon, and by a consequent adaption of the method of using it to the qualities it possesses, which will constitute its tactics. History shows that it is vain to hope that military men generally will be at the pains to do this, but that the one who does it will go into battle with a great advantage—a lesson in itself of no mean value.'"

Strategic lessons are permanent.

Captain Mahan has followed up this subject through a wide range of reading, and has succeeded in making it instructive and fruitful of suggestions for the naval administrations of the future. Great as are the changes in weapons and tactics, the strategic lessons of the past are of permanent value.

Lessons from Trafalgar.

While the special subject of Captain Mahan's book is the period 1660–1783, in an opening chapter he eloquently describes the battle of Trafalgar as the final act in a grand strategic drama, in which two of the greatest leaders that ever lived, Napoleon and Nelson, were pitted one against the other. "At Trafalgar it was not Villeneuve that failed, but Napoleon that was vanquished, not Nelson that won, but England that was saved. And why? Because Napoleon's combinations failed, and Nelson's intuitions and activity kept the English fleet ever on the track of the enemy, and brought it up at the decisive moment. . . . The great lessons of efficiency in preparation, of activity and energy in execution, and of thought and insight on the part of the English leader during the previous months, are strategic lessons which will be studied with profit in all succeeding ages."

Napoleon foiled by Nelson.

It was Napoleon's aim, in the campaign which ended at Trafalgar, to unite in the West Indies the French fleets of Brest, Toulon, and Rochefort, together with the ships contributed by Spain, and to direct this overwhelming force upon the English Channel. To Nelson was entrusted the duty of watching Toulon. He was mistaken in assuming that Villeneuve would certainly make for Egypt as soon as he got to sea. It was a true insight to fasten on the fleet and not the station as the key of the situation. Nelson, by his energetic pursuit of Villeneuve to the West Indies and back to

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the shores of Spain, and Collingwood, by the tenacious grip with which the blockade of Brest was maintained, successfully frustrated Napoleon's combinations. To quote from Captain Mahan, "the British forces, though very inferior in number to the forces of the allies, yet, being united in one great fleet in the Bay of Biscay, were effectively interposed between the two divisions of the enemy in Brest and Ferrol. The British fleet was superior in number to either singly, with a strong probability of being able to deal with one before the other could come up." The study of operations so ably and successfully conducted cannot fail to be full of instruction for all succeeding ages.

Elements of sea-power.

In his chapter on 'The Elements of Sea-power,' Captain Mahan enlarges on the many sources of England's strength. Neither forced to defend ourselves by land, nor induced to seek extension of territory by the way of the land, we have in unity of aim directed upon the sea an advantage over all continental powers. The possession of Gibraltar and Malta makes us strong in the Mediterranean, while chains of coaling-stations, admirably situated, give us unrivalled advantages in the distant oceans. In our reserves both of ships and men of the mercantile marine we have an overwhelming superiority over rivals, who might be reckoned almost our equals, if strength could be measured solely or chiefly by a comparison of the military navies. Aptitude for commercial pursuits has been a distinguishing characteristic of all nations which have been strong at sea. In this regard England may be justly reckoned pre-eminent. England's unique and wonderful success as a colonising nation is rightly regarded by Captain Mahan as another essential element of her maritime superiority. Our strength at sea rests on the broad basis of a great trade, large mechanical industries, and an extensive colonial system.

Position of France, Henry IV. to Louis XIV.

Commencing his historical survey with the year 1660, Captain Mahan describes with graphic touches the position of France, placed between Spain and the German States, among which Austria stood without a rival. Under Henry IV. and Richelieu the policy of France had been chiefly directed (1) to maintaining internal union; (2) to resisting Austria by an alliance with the Protestant German States; (3) to extending her boundaries eastward, at the expense of Spain; (4) to creating a great sea-power, as the best defence against England. The policy of his predecessors was abandoned by Louis XIV. Having married the eldest daughter of Philip IV. of Spain, he was ambitious for the union of the two crowns. In the desire for extending dominion by land the Navy was neglected.

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During the war of the Spanish Succession her regular fleets were practically withdrawn from the ocean, and the efforts of France were confined to privateering. Those were the days of Jean Bart, Forbin, and Duguay Trouin.

Commerce-destroying.

In dealing with this period of history, Captain Mahan takes occasion for an interesting dissertation on commerce-destroying war. While great losses may be inflicted, such a war cannot stand alone. It must be waged from a base, and that base must be either home ports or some solid outport of the national power; it may be a powerful fleet, it may be a fortified and secure coaling-station. The nation which has the most powerful fleets will deprive a rival of bases on which a cruising warfare must rest.

War of Spanish Succession.

It will not be possible to follow Captain Mahan in his comprehensive sketch of the history of the world, as examined from the naval stand-point. The story of the war of the Spanish Succession is fully narrated. England issued from the strife with Gibraltar and Port Mahon in her hands, thenceforward to be a Mediterranean power. In America she obtained, under the provisions of the Treaty of Utrecht, Nova Scotia and Newfoundland. Captain Mahan dates the commanding position of England at sea from the war of the Spanish Succession, and he attributes the result to the union, carefully fostered, of a great Navy and a prosperous commerce.

Seven Years' War.

Capture of Quebec.

The possession of Canada by the French, threatening as it did the British Colonies in North America, led to an early renewal of the conflicts which had been temporarily suspended by the Treaty of Aix-la-Chapelle. At the opening of the Seven Years' War (1756–63), France had 63 ships of the line, Spain 46, England 130 ships. Making the continental war wholly subsidiary, the efforts of Great Britain, under the bold direction of Pitt, were concentrated upon the sea and the colonies. With a powerful fleet as his base of operations, Wolfe was sent out at the head of the expedition. He succeeded in capturing Quebec on the 8th of September, 1760. This disaster put an end for ever to the French possession of Canada.

General plan of British Government.

Besides the expedition under Wolfe, the general plan of the British Government embraced:—

(I.) The blockade of the French Atlantic ports, especially Brest.

(II.) Attack on the Atlantic and Channel coasts with flying squadrons.

(III.) A fleet in the Mediterranean, to prevent the French Toulon fleet from getting round into the Atlantic.

(IV.) Expeditions against the French West Indies. Maintenance of a squadron in the East Indies.

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The Toulon fleet was beaten by Boscawen. The Brest fleet, under Marshal de Conflans, was annihilated by Lord Hawke in a hazardous battle fought in a gale of wind off a lee-shore. In 1761 Pondicherry surrendered to our superior forces. In 1762 the French surrendered Martinique, and the Spaniards Havana, together with twelve ships of the line, and £3,000,000 in money and merchandise. These events were followed by the peace signed at Fontainebleau, in which France renounced Canada and Spain Florida. Success in East and West Indies.

Captain Mahan, as might be expected, enters with considerable detail into the war of the American Revolution. It is a dark chapter in our history, on which English writers will dwell as briefly as possible. Captain Mahan offers much suggestive criticism on the manner in which the British Government conducted the war against the superior forces of France, Spain, and the revolted Colonies. We were everywhere on the defensive, with inferior forces. War of American Revolution.

In the war in Europe, 1779–82, the results turned entirely upon the relative sea-power of the contending nations. By the address and fortune of her seamen England was kept secure from invasion. The gallant defence of Gibraltar is well described by Captain Mahan. He commends the national instinct which clung with such high courage and tenacity to that important position. War in Europe, 1779–82.

The brilliant naval campaign of Suffren, in the Indian Seas, in 1782–83, fills a chapter of great interest. Full justice is done to the seamanlike aptitude and the courage beyond all proof which were shown by the British Admiral Hughes. The steadfastness of purpose exhibited by Suffren receives not less ample acknowledgment in the pages of a writer, who is able to review the history of these encounters with absolute impartiality. Suffren and Hughes, 1782–83.

The memorable operations in the West Indies, in which De Grasse was pitted against Rodney and Hood, fill a large space in Captain Mahan's pages. The details of the great naval battle of the 12th of April, 1782, are fully given. Rodney and De Grasse.

The volume under notice concludes with a masterly discussion of the war of 1778. The course pursued by England of keeping near the enemy's ports, and bringing his fleets to action at the earliest opportunity if he got out, is fully approved. Naval students and readers will look forward with impatience to a continuation of Captain Mahan's able work from 1783 down to the present time. General conclusions.

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PART II.

BRITISH AND FOREIGN

ARMOURED AND UNARMOURED SHIPS.

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PART II.

I.

BRITISH ARMOURED AND UNARMOURED SHIPS.

THE list of ships of the British Navy has been compiled from various sources. The official *Navy List* has been the principal guide, and the list is also in accordance with the Navy Estimates for 1891–92. As a rule the displacement and indicated horse-power have been given as stated in the *Navy List*. Wherever possible the column under the heading "speed" has been filled up from reports of actual trial. With respect to the gun and torpedo armament, it is to be noted that, owing to the gradual substitution of breech-loaders for muzzle-loaders at present in progress, to the advance in the power of machine-guns, and to improved methods of ejecting locomotive torpedoes, changes are being continuously made. The columns for "coal-endurance" have been filled, as far as was possible, from the most authentic published reports of the trials of the several ships. Generally the mileage traversible at the speed mentioned has been computed from the quantity of fuel that can be carried in the bunkers. The computations, moreover, have generally been based upon performances, or estimates of performances, under the most favourable conditions.

To prevent confusion, the vessels popularly known as torpedo catchers are in these lists called torpedo gunboats. In the official *Navy List* they are called first-class gunboats.

The sketches of the ships are all drawn on the same scale (except in a few cases specially indicated), so that their relative sizes are apparent by inspection.

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GREAT BRITAIN.—Armoured Ships.

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret-ship; 2 *s.*, two screws.

M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; l., light guns under 15 cwt., including boats' guns; Q.F., quick-firing gun; M., machine gun; *comp.*, compound or steel-faced armour; f. tu., l. car., fixed tube or launching carriage for Whitehead torpedo discharge.

Class	NAME.	Displacement.	Indicated Horse-Power.	Draught of Water. Extreme.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Completion.	Cost.		Armour.			Backing.	Armament.		Speed.	Coal Endurance.	
										Hull.	Machinery.	Side.	Bulkhead.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in.	ft. in.	ft. in.				£	£	in.	in.	in.	in.			knots.	tons.	knots.
br.	**Achilles** (iron)	9820	5000	27 3	380 0	58 3½	Chatham	Penn	1864	375,429	69,117	4½	4½	..	18 to 10	14 9-in. 12-ton M.L.R., 2 6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 14 M., 6 l.	..	14·32	750	2500
t	**Agamemnon** 2 *s.* (iron)	8660	6360	24 0	280 0	66 0	Chatham	Penn	1883	402,295	101,770	18 & 15	16½ & 13½	16 & 14	18 to 9	4 12½-in. 38-ton M.L.R., 2 6-in. 81-cwt. B.L.R., 6 Q.F., 13 M., 2 l.	2 l. car.	13·25	960	4100
br.	**Agincourt** (iron)	10,690	6870	27 9	400 0	59 5	Birkenh'd	Maudslay	1868	381,700	83,777	5½	4½	..	10	17 9-in. 12-ton M.L.R., 15 M., 14 l.	2 l. car.	14·8	750	1300
t.	**Ajax** (iron) 2 *s.*	8660	6440	24 0	280 0	66 0	Pembroke	Penn	1883	411,622	106,735	18 & 15	16	16	18 to 9	4 12½-in. 38-ton M.L.R., 2 6-in. 81-cwt. B.L.R., 6 Q.F., 13 M., 2 l.	2 l. car.	13·25	960	4100
c.b.	**Alexandra** . 2 *s.* (iron)	9490	8610	26 6	325 0	63 8	Chatham	Humphrys	1877	394,263	120,061	12 to 6	8 to 5	..	12 & 10	8 18-ton M.L.R., 4 9·2-in. 22 ton. B.L.R., 6 4-in. 22-cwt. do., 10 Q.F., 15 M., 2 l.	4 l. car.	15·00	680	2700
b.	**Anson** (steel) 2 *s.*	10,600	11,500	27 3	330 0	68 6	Pembroke	Humphrys	1889	*x* and *y* 724,765		18 *comp.*	16 *comp.*	barbette 14 & 12 *comp.*	12 to 15	4 67-ton B.L.R., 6 6-in. 89 cwt. do., 19 Q.F., 7 M., 2 l.	1 f. tu., 4 l. car.	16·75	1200	7100

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c.b.	**Audacious** . 2 *s.* (iron) (Zinc sheathed)	6010	4830	23	8	280	0	54	0	Glasgow	Ravenhill .	1869	193,863 *x*	52,619 *y*	8 to 6	5	..	10	10 9-in. 12-ton M.L.R., 8 4-in. 22-cwt. B.L.R., 10 Q.F., 5 M., 4 l.	4 l. car.	13·2	500	1260
a.c.	**Aurora** (steel) 2 *s.*	5600	8500	22	6	300	0	56	0	Pembroke	J. & G. Thomson	1889	220,550	64,000	10 *comp.*	16 *comp.*	12 conning tower.	6	2 9·2-in. 22-ton B.L.R., 10 6-in. 89-cwt. B.L.R., 16 Q.F., 7 M., 3 l.	2 l. car.	18·5	900	8000
a.c.	**Australia** . 2 *s.* (steel)	5600	8500	22	6	300	0	56	0	Glasgow	Napier .	1889	195,390	63,000	10 *comp.*	16 *comp.*	12 conning tower.	6	2 9·2-in. 22-ton B.L.R., 10 6-in. 5-ton B.L.R., 16 Q.F., 7 M., 3 l.	2 l. car.	18·5	900	8000
b.	**Barfleur** (steel) 2 *s.* (Copper sheathed.)	10,500	13,000	25	6	360	0	70	0	Chatham	Greenock Foundry	Bldg.	Total. 607,746		12 4 above	..	9 barbette	..	4 10-in. 29-ton B.L.R., 10 4·7-in. Q.F., 17 6-pdr. and 3-pr. do.	5 f. tu. 2 being sub-merged.	18·0	750	..
c.b.	**Belleisle** (iron) 2 *s.* (was "Payki-Sherreef").	4870	3200	21	0	245	0	52	0	Poplar .	Maudslay .	1878	240,000 (purchased)		12,10, 8,6	9,6,5	9 conning tower.	16 & 9	4 12-in. 25-ton M.L.R., 6 Q.F., 9 M., 2 l.	2 l. car.	12·20	510	1824
c.b.	**Bellerophon** (iron)	7550	6520	26	7	300	0	56	1	Chatham	Penn .	1866	235,738	86,963	6	5	8 pilot tower.	10	10 8-in. 14-ton B.L.R., 4 6-in. 89-cwt. do., 6 4-in. 22-cwt. do., 4 Q.F., 12 M., 4 l.	2 l. car.	14·17	650	1610
b.	**Benbow** (steel) 2 *s.*	10,600	11,500	28	4	330	0	68	6	Blackwall	Maudslay .	1888	650,820 *x*	110,000 *y*	18 *comp.*	16 *comp.*	14 & 12 on barbette *comp.*	12 to 15	2 111-ton B.L.R., 10 6-in. 5 ton do., 15 Q.F., 6 M., 2 l.	1 f. tu. 4 l. car.	16·75	1200	7100
br.	**Black Prince** . (iron)	9210	5770	26	10	380	2	58	4	Glasgow .	Penn .	1862	283,154	74,482	4½	4½	..	18 to 10	4 8-in. 9-ton M.L.R., 22 7-in. 6½-ton do., 2 6-in. 89-cwt. B.L.R., 4 Q.F., 7 M., 8 l.	2 l. car.	13·60	750	1080
b.	**Camperdown** 2 *s.* (steel)	10,600	11,500	27	3	330	0	68	6	Portsm'th	Maudslay .	1889	*x* and *y* 769,456		18 *comp.*	16 *comp.*	12 to 14 on barbette *comp.*	10 to 15	4 67-ton B.L.R., 6 6-in. 5 ton do., 19 Q.F., 7 M., 2 l.	1 f. tu. 4 l. car.	16·75	1200	7100
	Centurion 2 *s.* (steel) (Copper sheathed.)	10,500	13,000	25	6	360	0	70	0	Portsm'th	Greenock Foundry	Bldg.	Total. 615,771		12 4 above	..	9 barbette	..	4 10-in. 29-ton B.L.R., 10 4·7-in. Q.F., 17 6-pdr. and 3-pr. do.	5 f. tu. 2 being sub-merged.	18.0	750	..

x Includes Hydraulic Machinery, Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Armoured Ships—*continued.*

a.c., armoured cruiser; ***a.g.b.***, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t*, turret-ship; 2 *s.*, two screws.

M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; l., light guns under 15 cwt., including boats' guns; Q.F., quick-firing gun; M., machine guns; *comp.*, compound or steel-faced armour; f. tu., l. car., fixed tube or launching carriage for Whitehead torpedo discharge.

Class.	NAME.	Displacement.	Indicated Horse-Power.	Draught of Water. Extreme.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Completion.	Cost.		Armour.			Backing.	Armament.		Speed.	Coal Endurance.	
										Hull.	Machinery.	Side.	Bulkhead.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in.	ft. in.	ft. in.				£ x	£ y	in.	in.	in.	in.			knots.	tons.	knots.
b.	Collingwood 2 *s.* (steel)	9500	9570	26 10	325 0	68 0	Pembroke	Humphrys	1886	520,000	104,000	18 *comp.*	16 *comp.*	12 to 14 on barbette	17 to 10	4 12-in. 45-ton B.L.R., 6 6-in. 89-cwt. do., 15 Q.F., 11 M., 2 l.	4 l. car.	16·50	1200	8500
t.	Colossus (steel) 2 *s.*	9420	7500	26 3	325 0	68 0	Portsm'th	Maudslay .	1886	533,000	113,786	18 & 14	16 & 13	16 & 14 turret.	22 to 10	4 12-in. 45-ton B.L.R., 4 6-in. 5-ton do., 4 Q.F., 15 M., 4 l.	2 l. car.	15·50	970	6200
t.	Conqueror. 2 *s.* (steel)	6200	6000	24 0	270 0	58 0	Chatham	Humphrys	1882	325,000	93,433	12 to 8½	11½ to 10½	12 turret & conning tower.	10 to 13½ on sides, 9 on bulkheads.	2 12-in. 45-ton B.L.R., 4 6-in. 89-cwt. do., 6 Q.F., 12 M., 2 l.	6 l. car.	15·50	650	5200
c.s., *t.*	Cyclops (iron) 2 *s.*	3560	1660	16 4	225 0	45 0	Blackwall	Elder .	1871	136,426	17,600	8 & 6	9 & 8 on breastwork.	9 & 10	9 & 11	4 10-in. 18-ton M.L.R, 4 3-pdr. Q.F., 5 M., 1 l.	..	11·0	250	1920
br.	Defence (iron) (Non-effective in Navy List)	6270	2540	26 7	280 0	54 2	Jarrow .	Penn .	1862	197,879	34,357	4½	4½	..	18	2 9-ton M.L.R., 14 6½-ton do., 6 M., 4 l.	..	11·62	450	1100
t.	Devastation 2 *s.* (iron)	9330	6650	27 6	285 0	62 3	Portsm'th	Penn .	1873	290,660	63,188	12 & 10	12 & 10 breastwork.	14 & 12	18 to 16	4 10-in. 29-ton B.L.R., 14 Q.F., 4 M., 2 l.	2 l. car.	13·84	1800	5980

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t.	**Dreadnought** (iron)	2 *s.*	10,820	8210	26	9	320	0	63	10	Pembroke	Humphrys	1875	485,573 *x*	107,000 *y*	14,12, 11	13	14	18to15	4	12½-in. 38-ton M.L.R., 6 Q.F., 16 M., 2 l.	2 f. tu.	14·20	1330	5720
t.	**Edinburgh** (steel)	2 *s.*	9420	7500	26	3	325	0	68	0	Pembroke	Humphrys	1886	555,333 *x*	87,000 *y*	18 & 14	16 & 13	16 & 14	22to10	4	45-ton 12-in. B.L.R., 5 6-in. 5-ton do., 7 Q.F., 13 M., 2 l.	2 l. car.	15·50	970	6200
a.c.	**Galatea** (steel)	2 *s.*	5600	8500	22	6	300	0	56	0	Glasgow	Napier	1889	195,390 *x*	63,000 *y*	10 *comp.*	16 *comp.*	12 conning tower.	6	2	9·2-in. 22-ton B.L.R., 10 6-in. 5-ton do., 16 Q.F., 7 M., 3 l.	4 l. car.	18·5	900	8000
c.s., *t.*	**Glatton** (iron)	2 *s.*	4910	2870	19	5	245	0	54	0	Chatham	Laird	1872	189,133	30,396	12to10	12 breast-work.	14 & 12	20 to15	2	12-in. 25-ton M.L.R., 3 6-pdr. Q.F., 4 M., 2 l.	2 sub. f. tu.	12·11	540	2000
c.s., *t.*	**Gorgon** (iron)	2 *s.*	3560	1670	16	4	225	0	45	0	Jarrow	Ravenhill	1872	122,904	15,663	8 & 6	9 & 8 breast-work.	9 & 10	11 to 9	4	10-in. 18-ton M.L.R., 4 3-pdr. Q.F., 5 M., 2 l.	..	11·14	270	1230
c.s., *t.*	**Hecate** (iron)	2 *s.*	3560	1750	16	4	225	0	45	0	Poplar	Ravenhill	1872	124,906	15,687	8 & 6	9 & 8 breast-work.	9 & 10	11 to 9	4	10-in. 18-ton M.L.R., 4 3-pdr. Q.F., 4 M., 1 l.	..	10·90	270	1230
br.	**Hector** (iron)		6710	3260	26	0	280	2	56	5	Glasgow	Napier	1864	237,438	45,764	4½	4½	..	18	2	8-in. 9-ton M.L.R., 16 7-in. 6½-ton do., 8 M., 5 l.	..	12·36	460	1460
c.b.	**Hercules** (iron)		8680	6750	26	6	325	0	59	0½	Chatham	Penn	1868	278,320	82,814	9 to 6	6 & 5	..	12 & 10	8	18-ton M.L.R., 2 12½-t. do., 4 7-in. 6½-ton do., 6 4-in. 22-cwt. B.L.R., 7 Q.F., 10 M., 3 l.	4 l. car.	14·00	610	1760
t.	**Hero** (steel)	2 *s.*	6200	6000	24	0	270	0	58	0	Chatham	Rennie	1887	338,971 *x*	58,300 *y*	12 *comp.*	11½ *comp.*	12 *comp.*	13½	2	12-in. 45-ton B.L.R., 4 6-in. 5-ton do., 12 Q.F., 6 M., 2 l.	6 l. car.	15·5	620	5200
t.	**Hood** (steel)	2 *s.*	14,150	13,000	27	6	380	0	75	0	Chatham	Humphrys	Bldg.	Total. 851,260		18 *comp.* 4 above the belt.	17 bar-bette.	..	..	4	67-ton B.L.R., 10 6-in. Q.F. and 18 other Q.F., 8 M., 2 l.	7 f. tu. or l. car.	17·5	900	5000

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GREAT BRITAIN.—Armoured Ships—*continued.*

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										Hull.	Machinery.	Side.	Bulkhead.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
c.s., *t.*	**Hotspur** (iron) 2 *s.*	tons. 4010	3060	ft. in. 21 10	ft. in. 235 0	ft. in. 50 0	Glasgow	Napier	1871	£ 135,067	£ 36,461	in. 11 & 8	in. 8 breast-work.	in. 10 & 8½	in. 15 to 12 on side 10 on turret.	2 25-ton M.L.R., 2 6-in. 81-cwt. B.L.R., 4 Q.F., 9 M., 2 l.	2 l. car.	knots. 12·8	tons. 300	knots. 920
b.	**Howe** (steel) 2 *s.*	10,300	11,500	27 3	325 0	68 0	Pembroke	Humphrys	1887	*x* 560,469	*y* 106,553	18 *comp.*	16 *comp.*	11½ to 10 on barbette.	15 to 12	4 67-ton B.L.R., 6 6-in. 5-ton do., 19 Q.F., 7 M., 2 l.	1 f. tu. 4 l. car.	16·75	1200	7200
c.s., *t.*	**Hydra** (iron) 2 *s.*	3560	1470	16 4	225 0	45 0	Glasgow	Elder	1872	124,454	16,918	8 & 6	9 & 8 on broadside work.	9 & 10	11 to 9	4 18-ton M.L.R., 4 Q.F., 5 M., 2 l.	..	11·20	250	1920
a.c.	**Immortalité.** (steel) 2 *s.*	5600	8500	22 6	300 0	56 0	Chatham	Earle	1889	*x* 221,500	*y* 57,000 Estd.	10 *comp.*	16 *comp.*	12 conning tower.	6	2 9·2-in. 22-ton B.L.R., 10 6-in. 89-cwt. do., 16 Q.F., 7 M., 3 l.	2 l. car.	18·50	900	8000
a.c.	**Impérieuse** (steel) (Copper sheathed.) 2 *s.*	8400	10,000	27 4	315 0	62 0	Portsm'th	Maudslay	1886	*x* 417,437	*y* 113,377	10 *comp.*	9 *comp.*	8 *comp.* on barbette.	10	4 9·2-in. 24-ton B.L.R., 6 6-in. 89-cwt. do., 8 Q.F., 9 M., 2 l.	2 f. tu. 4 l. car.	16·75	1130	7000
t.	**Inflexible** (iron) 2 *s.*	11,880	8010	26 4	320 0	75 0	Portsm'th	Elder	1881	648,811	146,457	24, 20, 16	22, 18, 14	17 & 16 *comp.*	17 to 25	4 16-in. 80-ton M.L.R., 8 4-in. 22-cwt. B.L.R., 5 Q.F., 15 M., 2 l.	2 f. tu. sub. 2 l. car.	13·80	1300	5200

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c.b.	**Invincible** (iron)	2 *s.*	6010	4830	23	2	280	0	54	0	Glasgow	Napier	1870	187,055	52,386	8 to 6		..	10	10 9-in. 12-ton M.L.R., 6 4-in. 22-cwt. B.L., 4 Q.F., 15 M., 4 l.	4 l. car.	14·09	500	1580
c.b.	**Iron Duke** (iron)	2 *s.*	6010	3520	23	3	280	0	54	0	Pembroke	Ravenhill	1871	146,314	50,165	8 to 6	5	..	10	10 9-in. 12-ton M.L.R., 4 5-in. 38-cwt. B.L.R., 4 Q.F., 14 M., 8 l.	4 l. car.	13·64	700	3900
br.	**Minotaur**	(iron)	10,690	5000	27	3	400	0	59	4¾	Blackwall	Penn	1867	377,325	79,505	5½	4½	..	10	17 9-in. 12-ton M.L.R., 12 Q.F., 6 M., 2 l.	2 l. car.	14·41	750	1200
t.	**Monarch**	(iron)	8320	7840	26	7	330	0	57	6	Chatham	Humphrys	1869	279,903	74,672	7 to 6	5 & 4½	10 & 8	12	4 12-in. 25-ton M.L.R., 2 12-ton M.L.R., 1 6½-ton do., 5 Q.F., 15 M., 3 l.	2 l. car.	14·94	630	1500
a.c.	**Narcissus** (steel)	2 *s.*	5600	8500	22	6	300	0	56	0	Hull	Earle	1889	*x* 195,890	*y* 61,500	10 *comp.*	16 *comp.*	12 conning tower.	6	2 9·2-in. 22-ton B.L.R., 10 6-in. 5-ton B.L.R., 16 Q.F., 7 M., 3 l.	4 l. car.	18·50	900	8000
a.c.	**Nelson** (iron) (Zinc sheathed.)	2 *s.*	7630	6640	26	6	280	0	60	0	Glasgow	Elder	1880	303,310	87,545	9 & 6	9,8,6	9 conning tower.	13 to 10	4 18-ton M.L.R., 8 12-ton M.L.R., 4 4·7-in. Q.F., 20 Q.F., 8 M., 3 l.	2 l. car.	14·41	1150	5200
t.	**Neptune** (iron) (Copper sheathed; was "Independencia.")		9310	8000	26	1	300	0	63	0	Poplar	Penn	1878	600,000 (purchased).		12 to 9	8 & 6	11 & 13	11 to 13	4 12½-in. 38-ton M.L.R., 2 9-in. 12-ton M.L.R., 14 Q.F., 10 M., 2 l.	2 l. car.	14·20	670	1480
t.	**Nile** (steel)	2 *s.*	11,940	12,000	27	6	345	0	73	0	Pembroke	Maudslay	1890	Total. 819,717		20 to 16 *comp.*	18 to 14 *comp.*	18 *comp.*	6	4 67-ton B.L.R., 6 4·7-in. Q.F., 8 6-pdr. do., 9 3-pdr. do., 2 l., 4 M.	2 f. tn. 2 l. car.	16·50	1200	6500
a.c.	**Northampton** (iron) (Zinc sheathed.)	2 *s.*	7630	6070	25	9	280	0	60	0	Glasgow	Penn	1878	296,836	98,968	9 & 6	9,8,6	9 conning tower.	13,10	4 10-in. 18-ton M.L.R., 8 12-ton M.L.R., 18 Q.F. (4 being 4·7-in.), 10 M., 3 l.	2 l. car.	13·20	1150	3850

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										Hull.	Machinery.	Side.	Bulkhead.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
br.	**Northumberland** (iron)	tons. 10,780	6560	ft. in. 27 1	ft. in. 400 4	ft. in. 59 5	Millwall	Penn	1868	£ 391,481	79,871	in. 5½	in. 4½	in. 5½ conning tower.	in. 10	7 9-in. 12-ton M.L.R., 20 8-in. 9-ton do., 1 6-in. 89-cwt. B.L.R., 1 5-in. 40-cwt. do., 4 Q.F., 10 M., 12 l.	4 l. car.	knots. 14·13	tons. 756	knots. 1270
c.b.	**Orion** (iron) 2 *s.* (was "Boordji-Zaffer")	4870	4040	21 4	245 0	52 0	Poplar	Maudslay	1882	239,270	52,959	12, 10, 8, 7	9, 6, 5	9 conning tower.	16 & 9	4 12-in. 25-ton M.L.R., 6 Q.F., 8 M., 2 l.	4 l. car.	13·0	520	1830
a.c.	**Orlando** (steel) 2 *s.*	5600	8500	22 6	300 0	56 0	Jarrow	Palmer	1888	*x* 206,647	*y* 60,165	10 *comp.*	16 *comp.*	12 conning tower.	6	2 9·2-in. 22-ton B.L.R., 10 6-in. 5-ton do., 16 Q.F., 7 M., 3 l.	4 l. car.	18·5	900	8000
c.b.	**Penelope** (iron) 2 *s.*	4470	4700	17 6	260 0	50 0	Pembroke	Maudslay	1868	145,993	40,855	6 & 5	4½	..	10 & 11	8 8-in. 9-ton M.L.R., 4 Q.F., 11 M., 4 l.	..	12·76	470	1360
c.s., *t.*	**Prince Albert** (iron)	3880	2130	20 4	240 0	48 1	Poplar	Humphrys	1866	178,537	24,129	4½	..	10 & 5½	18	4 9-in. 12-ton M.L.R., 6 M., 2 l.	..	11·65	230	930
b.	**Ramillies** 2 *s.* (steel)	14,150	13,000	27 6	380 0	75 0	Glasgow	Thomson	Bldg.	Total. 874,627		18 4 above the belt.	..	17 barbette.	..	4 67-ton B.L.R., 10 6-in. Q.F. and 18 other Q.F., 8 M., 2 l.	7 f. tu. or l. car.	17·5	900	5000

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b.	**Renown** (steel)	2 *s.*	14,150	13,000	27	6	380	0	75	0	Pembroke	Humphrys	Bldg.	Total. 833,327		18 4 above the belt.	..	17 barbette.	..	4	67-ton B.L.R., 10 6-in. Q.F. and 18 other Q.F., 8 M., 2 l.	7 f. tu. or l. car.	17·5	900	5000
b.	**Repulse** (steel)	2 *s.*	14,150	13,000	27	6	380	0	75	0	Pembroke	Humphrys	Bldg.	Total. 831,678		18 4 above the belt.	..	17 barbette.	..	4	67-ton B.L.R., 10 6-in. Q.F. and 18 other Q.F., 8 M., 2 l.	7 f. tu. or l. car.	17·5	900	5000
b.	**Resolution** (steel)	2 *s.*	14,150	13,000	27	6	380	0	75	0	Jarrow	Palmer	Bldg.	Total. 849,992		18 4 above the belt.	..	17 barbette.	..	4	67-ton B.L.R., 10 6-in. Q.F. and 18 other Q.F., 8 M., 2 l.	7 f. tu. or l. car.	17·5	900	5000
b.	**Revenge** (steel)	2 *s.*	14,150	13,000	27	6	380	0	75	0	Jarrow	Palmer	Bldg.	Total. 849,991		18 4 above the belt.	..	17 barbette.	..	4	67-ton B.L.R., 10 6-in. Q.F. and 18 other Q.F., 8 M., 2 l.	7 f. tu. or l. car.	17·5	900	5000
b.	**Rodney** (steel)	2 *s.*	10,300	11,500	27	3	325	0	68	0	Chatham	Humphrys	1887	*x* 563,878	*y* 105,400	18 *comp.*	16 *comp.*	11½ to 10 on barbette	15 to 12	1	69-ton B.L.R., 3 67-ton do., 6 6-in. 5-ton do., 14 Q.F., 10 M., 2 l.	4 l. car.	16·75	1200	8500
b.	**Royal Oak** (steel)	2 *s.*	14,150	13,000	27	6	380	0	75	0	Birkenh'd	Laird	Bldg.	Total. 874,415		18 4 above the belt.	..	17 barbette.	..	4	67-ton B.L.R., 10 6-in. Q.F. and 18 other Q.F., 8 M., 2 l.	7 f. tu. or l. car.	17·5	900	5000
b.	**Royal Sovereign** (steel)	2 *s.*	14,150	13,000	27	6	380	0	75	0	Portsm'th	Humphrys	1891	Total. 854,508		18 4 above the belt	..	17 barbette.	..	4	67-ton B.L.R., 10 6-in. Q.F. and 18 other Q.F., 8 M., 2 l.	7 f. tu. or l. car.	17·5	900	5000
c.s., t.	**Rupert** (iron)	2 *s.*	5440	6000	23	7	250	0	53	0	Chatham	Napier	1874	193,171	39,506	11 & 9	12 breast-work.	14 & 12	14 & 10	2	9·2-in. 22-ton B.L.R., 2 6-in. 89-cwt. do., 10 Q.F., 2 M., 2 l.	4 l. car.	13·59	480	1340
t.	**Sans Pareil** (steel)	2 *s.*	10,470	14,000	27	3	340	0	70	0	Blackwall	Humphrys	1889	*x* 609,109	*y* 110,333	16 to 18 *comp.*	16	18 *comp.*	6	2	111-ton B.L.R., 1 10-in. 29-ton do., 12 6-in. 5-ton do., 21 Q.F., 8 M. 2 l.	4 f. tu. 2 l. car.	16·75	1200	7000

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										Hull.	Machinery.	Side.	Bulk-head.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in.	ft. in.	ft. in.				£	£	in.	in.	in.	in.			knots.	tons.	knots.
c.s., *t.*	**Scorpion** (iron)	2750	1450	16 11	224 6	42 4½	Birkenh'd	Laird	1865	92,033	18,540	4½	..	5	10 to 8	4 9-in. 12-ton M.L.R., 4 3-pdr. Q.F., 6 M., 1 l.	..	10·51	320	1210
a.c.	**Shannon** (iron) (Zinc sheathed.)	5390	3370	23 4	260 0	54 0	Pembroke	Laird	1877	233,902	53,367	9, 8, 6	9 & 8	9 conning tower.	10 & 12	2 10-in. 18-ton M.L.R., 7 9-in. 12-ton do., 10 M., 8 l.	2 l. car.	12·35	580	2260
c.b.	**Sultan** . (iron)	9290	7720	27 6	325 0	59 0½	Chatham	Penn	1871	281,373	76,042	9, 8, 6	6 to 4½	..	12 & 10	8 10-in. 18-ton M.L.R., 4 9-in. 12½-ton M.L.R., 7 4-in. 22-cwt. B.L.R., 4 Q.F., 13 M. 11 l.	4 l. car.	14·13	810	2140
c.b.	**Superb** . (iron) (was "Hamidyeh").	9170	8500	26 5	332 3	59 0	Blackwall	Maudslay	1880	443,000 (purchased)		12, 10, 7	10, 7, 6 5	8 on conning tower.	7 to 12	16 10-in. 18-ton M.L.R., 6 4-in. 22-cwt. B.L., 16 Q.F., 6 M., 3 l.	4 l. car.	13·50	970	1810
c.b.	**Swiftsure** (iron) (Copper sheathed.)	6910	4910	26 0	280 0	55 0	Jarrow	Maudslay	1872	207,940	49,141	8 to 6	6, 5, 4	..	10	10 9-in. 12-ton M.L.R., 8 4-in. 22-cwt. B.L., 8 Q.F., 11 M., 2 l.	4 l. car.	13·75	540	1630

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c.b. & *b.*	**Temeraire** . 2 *s.* (iron) (Zinc sheathed.)	8540	7520	27	2	285	0	62	0	Chatham	Humphrys	1877	352,015	102,954	11, 10, 9, 8	8—5	10 fore 8 after barbette	12 & 10	4	11-in. 25-ton M.L.R., 4 10-in. 18-ton do., 6 4-in. 22-cwt. B.L.R., 6 Q.F., 13 M., 3 l.	2 l. car.	14·50	620	2680
t.	**Thunderer** . 2 *s.* (iron)	9330	7000	27	0	285	0	62	3	Pembroke	Maudslay (new engine)	1877	306,084	52,458	12 & 10	12 & 10 breastwork.	14 & 12	18 to 16	4	10-in. 29-ton B.L.R., 14 Q.F., 4 M., 2 l.	2 l. car.	13·40	1600	3040
t.	**Trafalgar** . 2 *s.* (steel)	11,940	12,000	27	6	345	0	73	0	Portsm'th	Humphrys	1887	765,794 *x*	97,000 *y*	20 to 16 *comp.*	18 to 14 *comp.*	18	6	4	67-ton B.L.R., 8 4·7-in. Q.F. 6 6-pdr. do., 9 3-pdr. do., 2 l. 4 M.	2 f. tu. 2 l. car.	16·50	1200	6500
c.b.	**Triumph** . (iron) (Copper sheathed.)	6640	5110	26	2	280	0	55	0	Jarrow	Maudslay	1873	209,109	49,213	8 to 6	6, 5, 4	..	10	10	9-in. 12-ton M.L.R., 4 5-in. 40-cwt. B.L.R., 16 Q.F., 4 M., 3 l.	4 l. car.	13·75	550	1680
a.c.	**Undaunted** 2 *s.* (steel)	5600	8500	22	6	300	0	56	0	Jarrow	Palmer Co.	1889	195,890 *x*	60,165 *y*	10 *comp.*	16 *comp.*	12 conning tower.	6	2	9·2-in. 22-ton B.L.R., 10 6-in. 5-ton do., 16 Q.F., 7 M., 3 l.	4 l. car.	18·5	900	8000
br.	**Valiant** . (iron) (Harbour Service.)	6710	3350	26	8	280	2	56	4	Poplar	Maudslay	1865	271,964	48,324	4½	4½	..	18	2	8-in. 9-ton. M.L.R, 16 7-in. 6½-ton do., 8 M., 4 l.	..	12·65	450	1430
t.	**Victoria** (steel) (was "Renown").	2 *s.* 10,470	14,000	27	3	340	0	70	0	Newcastle	Humphrys	1889	612,522	112,333	16 to 18 *comp.*	16	18 *comp.*	6	2	111-ton B.L.R., 1 29-ton do., 12 6-in. 5-ton do., 21 Q.F., 8 M., 2 l.	4 f. tu. 2 l. car.	16·75	1200	7000
a.g. b.	**Viper** (iron) (Coast Defence.)	2 *s.* 1230	700	11	8	160	0	32	0	Poplar	Maudslay	1867	43,517	7,610	4½	4½	..	10	2	6½-ton M.L.R., 4 3-pdr. Q.F., 2 l.	..	9·59	110	..
a.g. b.	**Vixen** . . (Composite.) (Coast Defence.)	2 *s.* 1230	740	11	8	160	0	32	5	Deptford Green	Maudslay	1866	46,333	7,860	4½	4½	..	10	2	6½-ton M.L.R., 2 l.	..	8·89	110	..
br.	**Warrior** . (iron)	9210	5270	26	9	380	2	58	4	Blackwall	Penn	1861	282,284	74,409	4½	4½	..	18 to 10	4	8-in. 9-ton M.L.R., 28 7-in. 6½ do., 8 M., 4 l.	..	14·40	790	1210

x Includes Hydraulic Machinery, Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Armoured Ships—*continued.*

a.c., armoured cruiser; *a.g.b.*, armoured gunbaat; *b*, barbette ship; *br.*, brordside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret-ship; 2 *s.*, twin-screws.

M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; l., light guns under 15 cwt., including boats' guns: Q.F., quick-firing gun; M., machine gun; *comp.*, compound or steel-faced armour; f. tu., l. car., fixed tube or launching carriage for Whitehead torpedo discharge.

Class.	NAME.	Displacement.	Indicated Horse-Power.	Draught of Water. Extreme.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Completion.	Cost.'		Armour.			Backing.	Armament.		Speed.	Coal Endurance.	
										Hull.	Machinery.	Side.	Bulk-head.	Turret.		Guns.	Fish Torpedo Dischargers.		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
		tons.		ft. in.	ft. in.	ft. in.				£ *x*	£ *y*	in.	in.	in.	in.			knots.	tons.	knots.
a.c.	**Warspite** . 2 *s.* (Copper sheathed.)	8400	10,000	27 4	315 0	62 0	Chatham	Penn	1886	415,546	113,786	10 *comp.*	9 *comp.*	8 barbette.	10	4 9·2-in. 22-ton B.L.R., 6 6-in. 89-cwt. do., 8 Q.F., 10 M., 3 l.	2 f. tu. 4 l. car.	16·75	1130	7000
c.s., *t.*	**Wivern** . (iron)	2750	1450	17 0	224 6	42 4	Birkenh'd	Laird	1865	98,118	18,396	4½	..	5	8 to 10	4 9-in. 12-ton M.L.R., 8 M., 1 l.	..	10·06	300	1150
	The following, which appear in the Official Navy List, belong to India and Australia:—												On breast-work.							
c.s., *t.*	**Abyssinia***(iron) 2 *s.* (*Indian Marine.*)	2900	950	14 6	225 0	42 0	Poplar	Dudgeon	1870	97,049	19,500	7 & 6	8 & 7 Do.	10 & 8	11 to 9	4 10-in. 18-ton M.L.R., 2 M., 2 l.	..	9·59	92	..
c.s., *t.*	**Cerberus**† (iron) 2 *s.* (*Colonial Marine.*)	3480	1370	15 3	225 0	45 0	Jarrow	Maudslay	1870	99,331	18,225	8 to 6	9 to 8 Do.	10 & 9	11 to 9	4 10-in. 18-ton M.L.R., 4 M., 2 l.	..	9·75	120	..
c.s., *t.*	**Magdala**‡ (iron) 2 *s.* (*Indian Marine.*)	3340	1440	15 3	225 0	45 0	Blackwall	Ravenhill	1870	115,400	17,000	8 to 6	9 to 8	10 & 9	11 to 9	4 10-in. 18-ton M.L.R., 2 M., 2 l.	..	10·67	120	..

x Includes Hydraulic Machinery, Gun Mountings, &c.

y Propelling Machinery.

* At Bombay.

† At Melbourne, Va.

‡ At Bombay

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.

comp., composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu., fixed torpedo-tube; b. tu., bow do.; l. car., launching torpedo carriage; P., deck protected throughout; pp., deck protected amidships. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			Tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Sloop . .	**Acorn** . .	*Comp.*	970	1380	14 0	167 0	32 0	Milford Haven	Maudslay.	1884	27,500	14,500	8 5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	12·2	150	1900
Cruiser . . (2nd class)	**Active** . .	Iron wood and copper sheathed	3080	4130	21 4	270 0	42 0	Blackwall	Humphrys	1869	85,795	40,361 Total.	10 6-in. 81-cwt. B.L.R., 2 64-pdrs. M.L.R., 9 M., 2 l.	2 l. car.	15·10	410	2000
Cruiser P. (2nd class)	**Æolus** . 2 *s.*	Steel	3600	9000	17 6	300 0	43 0	Devonp'rt	Hawthorn.	Bldg.	188,352		2 6-in. B.L., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car.	19·75	400	8000
Desp. Vessel .	**Alacrity** . 2 *s.*	Steel	1700	3180	14 0	250 0	32 6	Jarrow .	Palmer .	1885	*x* 48,289	*y* 29,680	4 5-in. 38-cwt. B.L.R., 4 6-pdr. Q.F., 2 M.	..	17·00	400	6450
1st Class Torpedo Gun Boat	**Alarm** . 2 *s.*	Steel	810	3500	8 9	230 0	27 0	Sheerness	Penn .	Bldg.	..	..	2 4·7-in. Q.F., 4 3-pdr. do. .	1 f. tu. or l. car.	19·25	100	2500
Gun Boat . . (2nd class)	**Albacore** . .	*Comp.*	560	660	10 6	135 0	26 0	Birkenh'd	Laird .	1883	18,000	8,500	2 5-in. 38-cwt. B.L.R., 2 4-in. 22-cwt. do., 2 M.	..	11·0	85	..
Gun Vessel . (2nd class)	**Algerine** . .	*Comp.*	835	810	13 7	157 0	29 6	Belfast .	Laird .	1880	25,896	10,556	2 64-pdr. M.L.R., 2 5-in. 40-cwt. B.L.R., 4 M., 1 l.	..	10·50	110	1100
Cruiser pp. (2nd class)	**Amphion** . 2 *s.*	Steel	4300	5550	20 6	300 0	46 0	Pembroke	Maudslay .	1883	95,000	65,500 Total.	10 6-in. 5-ton B.L.R., 4 Q.F., 12 M., 2 l.	4 l. car.	17·00	1000	11,000
Cruiser P. (2nd class)	**Andromache** 2 *s.*	Steel	3400	9000	16 6	300 0	43 0	Chatham.	Earle .	1890	185,997		2 6-in. Q.F., 6 4·7-in. do., and 9 other do.	4 f. tu. or l. car.	20·0	400	8000

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp., composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun: Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coal that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
Torpedo or 1st class Gun Boat	Antelope . 2 *s.*	Steel	Tons. 810	3500	ft. in. 8 9	ft. in. 230 0	ft. in. 27 0	Devonp'rt	Yarrow .	Bldg.	£ ..	£ ..	2 4·7-in. Q.F., 4 3-pdr. do. .	..	knots. 19·25	tons. 100	knots. ..
Cruiser . P. (2nd class)	Apollo . .	Steel	3400	9000	16 6	300 0	43 0	Chatham.	Earle .	1890	Total. 185,877		2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car.	20·0	400	8000
Cruiser . . (3rd class)	Archer . 2 *s.*	Steel	1770	3500	14 6	225 0	36 0	Glasgow .	Thomson .	1886	*x* 55,916	*y* 31,667	6 6-in. 5-ton B.L.R., 8 3-pr. Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·80	475	7000
Cruiser pp. (2nd class)	Arethusa . 2 *s.*	Steel	4300	5500	20 6	300 0	46 0	Glasgow .	Napier .	1882	86,763	58,435	10 6-in. 89-cwt. B.L.R., 4 Q.F., 12 M., 2 l.	4 l. car.	17·00	1000	11,000
Cruiser P. (2nd class)	Astrea . 2 *s.*	Steel copper sheathed	4360	9000	19 0	320 0	49 6	Devonp'rt	Devonport	Bldg.	..	..	2 6-in. Q.F., 8 4·7-in. do., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car.	19·5	400	..
Cruiser . . (2nd class)	Bacchante .	Iron zinc sheathed	4130	5420	23 9	280 0	45 6	Portsm'th	Rennie .	1876	152,454	76,954	4 6-in. B.L.R., 10 90-cwt. M.L.R., 12 M., 8 l.	2 l. car.	15·06	570	4070
Gun Boat . . (2nd class)	Banterer . .	*Comp.*	465	440	10 0	125 0	23 6	Barrow .	..	1880	15,600	5,300	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..
Cruiser . P. (3rd class)	Barham . 2 *s.*	Steel	1830	6000	13 3	280 0	35 0	Portsm'th	Hawthorn .	1889	Total. 113,302		6 4·7-in. Q.F., 4 3-pdr. Q.F., 2 M.	2 f. tu. or l. car	19·5	140	2600
„ „ P.	Barracouta 2 *s.*	Steel	1580	3000	14 0	220 0	35 0	Sheerness	Palmer .	1889	Total. 96,615		6 4·7-in. Q.F., 4 3-pdr. Q.F., 2 M.	2 f. tu. or l. car	16·5	160	3400
Cruiser . P. (3rd class)	Barrosa . 2 *s.*	Steel	1580	3000	14 0	220 0	35 0	Portsm'th	Palmer .	1889	Total. 79,238		6 4·7-in. B.F., 4 3-pdr. do., 2 M.	2 f. tu. or l. car	16·5	160	3400

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																Total.						
Sloop	.	.	Basilisk	.	2 *s.*	Steel copper sheathed	1170	2000	12	6	195	0	28	0	Sheerness	Rennie	.	1889	58,013		8 5-in. 40-cwt., B.L.R., 8 M.	..	14·5	160	3000
„	.	.	Beagle	.	2 *s.*	Steel copper sheathed	1170	2000	12	6	195	0	28	0	Portsm'th	Rennie	.	1889	Total. 56,474		8 5-in. 40-cwt., B.L.R., 8 M.	..	14·5	160	3000
Cruiser (3rd class)	.	P.	Bellona	.	2 *s.*	Steel	1830	6000	28	0	35	0	13	3	Newcastle	Hawthorn	.	1890	Total. 93,650		6 4·7-in. Q.F., 4 3-pdr. do., 2 M.	2 f. tu. or l.car	19·5	140	2600
Cruiser (1st class)	.	P.	Blake	.	2 *s.*	Steel	9000	20,000	25	9	375	0	65	0	Chatham	Maudslay	.	1889	Total. 433,755		2 9·2-in. 22-ton B.L.R., 10 6-in. 5-ton do, 16 3-pdr. Q.F., 8 M., 2 l.	4 f. tu. or l.car	22·0	1500	15,000
Cruiser (3rd class)	.	P.	Blanche	.	2 *s.*	Steel	1580	3000	14	0	220	0	35	0	Pembroke	Earle	.	1889	Total. 91,112		6 4·7-in. Q.F., 4 3-pdr. Q.F., 2 M.	2 f. tu. or l.car	16·5	160	3400
Cruiser (1st class)	.	P.	Blenheim	.	2 *s.*	Steel	9000	20,000	25	9	375	0	65	0	Thames Ironworks	Humphrys	1890	..	..		2 9·2-in. 22-ton B.L.R., 10 6-in. do., 16 3-pdr. Q.F., 2 M., 2 l.	4 f. tu. or l.car	22·0	1500	15,000
Cruiser (3rd class)	.	P.	Blonde	.	2 *s.*	Steel	1580	3000	14	0	220	0	35	0	Pembroke	Earle	.	1889	Total. 90,059		6 4·7-in. Q.F., 4-3-pdr. Q.F., 2 M.	2 f. tu. or l.car	16·5	160	3400
Cruiser (2nd class)	.	.	Boadicea	.	.	Iron copper sheathed	4140	5130	23	8	280	0	45	0	Portsm'th	Rennie	.	1875	153,167	70,409	2 6-in. 81-cwt. B.L.R., 12 90-cwt. M.L.R., 6 Q.F., 11 M., 2 l.	2 l. car.	14·70	570	3000
„	„	P.	Bonaventure	.	2 *s.*	Steel copper sheathed	4360	9000	19	0	320	0	49	6	Devonp'rt	..	Bldg.	..	..		2 6-in. Q.F., 6 4·7-in. do., and 9 other do., 4 M., 1 l.	4 f. tu. or l.car	19·5	400	..
1st Class Torpedo Gun Boat			Boomerang (Special for Australia)		2 *s.*	Steel	735	4500	8	3	230	0	27	0	Elswick	Bellis	.	1889	Total. 49,962		2 4·7-in. Q.F., 4 3-pdr. do., 1 M.	1 f. tu. 2 l. car.	21·00	100	2500
Gun Boat (1st class)	.		Bramble	.	2 *s.*	*Comp.*	715	1000	11	0	165	0	29	0	Belfast	Harland	.	1886	39,835	10,000	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·0	105	2500
Cruiser (2nd class)	.	P.	Brilliant	.	2 *s.*	Steel copper sheathed.	3600	9000	17	6	300	0	43	8	Sheerness	Hawthorn	.	Bldg.	Total. 195,098		2 6-in. Q.F., 6 4·7 in. do., and 9 other do., 4 M., 1 l.	4 f. tu. or l.car	19·75	400	8000
Cruiser (3rd class)	.		Brisk	.	2 *s.*	Steel	1770	3500	14	3½	225	0	36	0	Glasgow	Thomson	.	1886	55,916	31,667	6 6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00	325	4850
Gun Boat (2nd class)	.		Bullfrog	.	1 *s.*	*Comp.*	465	420	9	6	125	0	23	6	Pembroke	Maudslay	.	1881	16,300	6,050	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..

x Includes Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.

comp., composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coal that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				*x*	*y*			knots.	tons.	knots.
Sloop . .	**Buzzard** . 2 *s.*	*Comp.*	1140	2000	11 6	195 0	28 0	Sheerness	Barrow .	1887	42,500	16,200	8 5-in. 40-cwt. B.L.R. guns, 8 M.	..	14·50	160	3000
Cruiser . pp. (3rd class)	**Calliope** . .	Steel copper sheathed	2770	4020	19 11	235 0	4 6	Portsm'th	Rennie .	1884	82,000	38,000	4 6-in. 5-ton B.L.R., 12 5-in. 38-cwt. do., 10 M., 2 l.	2 l. car.	13·75	550	4000
„ „ „	**Calypso** . .	Steel Do.	2770	3720	19 11	235 0	44 6	Chatham	Rennie .	1883	82,000	37,500	4 6-in. 5-ton B.L.R., 12 5-in. 38-cwt. do., 10 M., 2 l.	2 l. car.	13·75	550	4000
Cruiser . P. (2nd class)	**Cambrian**. 2 *s.*	Steel Do.	4360	9000	19 0	320 0	49 6	Pembroke	..	Bldg.	..	..	2 6-in. Q.F., 8 4·7-in. do., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·5	400	..
Cruiser . pp. (3rd class)	**Canada** . .	Steel Do.	2380	2430	19 1	225 0	44 6	Portsm'th	Rennie .	1881	78,000 estim'td	26,500 estim'td	10 6-in. 81-cwt. B.L.R., 6 M., 2 l.	2 l. car.	13·00	470	5400
„ „ „	**Caroline** . .	*Comp.*	1420	1440	15 9	200 0	38 0	Sheerness	Maudslay .	1882	56,000	15,000	14 5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	13·10	400	6400
„ „ „	**Carysfort** . .	Steel copper sheathed	2380	2400	19 3	225 0	44 6	Glasgow .	Elder .	1878	84,512	29,942	2 90-cwt. M.L.R., 12 64-pdr. do., 6 M., 2 l.	2 l. car.	12·96	470	3840
„ „ „	**Champion**. .	Steel copper sheathed	2380	2340	19 3	225 0	44 6	Glasgow .	Elder .	1878	84,288	29,695	4 6-in. 89-cwt. B.L.R., 8 5-in. 40-cwt. do., 4 3-pdr. Q.F., 6 M., 2 l.	2 l. car.	13·00	470	3840
Cruiser . . (2nd class)	**Charybdis** P.	Steel copper sheathed	4360	9000	19 0	320 0	49 6	Sheerness	..	Bldg.	..	..	2 6-in. Q.F., 8 4·7-in do., 9 6-pdr. and 3-pdr. do.	4 f. tu. or l. car	19·5	400	..
1st Class Torpedo Gun Boat	**Circe** . . 2 *s.*	Steel	810	3500	8 9	230 0	27 0	Sheerness	Penn .	Bldg.	..	..	2 4·7-in. Q.F., 4 3-pdr. do. .	1 f. tu., 2 l. car.	19·25	100	2500

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Cruiser . pp. (3rd class)	**Cleopatra** .	.	Steel copper sheathed	2380	2610	19	3	225	0	44	6	Glasgow .	Humphrys	1878	86,126	27,798	4	6-in. 89-cwt. B.L.R., 8 5-in. 40-cwt. do., 4 3-pdr. Q.F. 6 M., 2 l.	2 l. car.	13·00	470	3280
Gun Boat . . (2nd class)	**Cockchafer**	.	*Comp.*	465	470	9	6	125	0	23	6	Pembroke	Maudslay .	1881	16,000	61,000	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..
Cruiser . pp. (3rd class)	**Comus** .	.	Steel copper sheathed	2380	2450	19	3	225	0	44	6	Glasgow .	Elder .	1878	84,497	29,477	4	6-in. 81-cwt. B.L.R., 8 64-pdr. M.L.R., 8 M., 2 l.	2 l. car.	12·93	470	3800
„ „ pp.	**Conquest** .	.	Steel copper sheathed	2380	2670	19	3	225	0	44	6	Glasgow .	Humphrys	1878	83,707	27,205	2	90-cwt. M.L.R., 12 64-pdr. do., 6 M., 2 l.	2 l. car.	13·00	470	3280
„ „ „	**Constance** .	.	Steel Do.	2380	2590	19	3	225	0	44	6	Chatham .	Penn .	1880	78,000 estim'td	32,000 estim'td	2	90-cwt. M.L.R., 12 64-pdr. do., 6 M., 2 l.	2 l. car.	13·72	470	5000
„ „ „	**Cordelia** .	.	Steel Do.	2380	2420	19	3	225	0	44	6	Portsm'th	Rennie .	1881	78,000	26,500	10	6-in. 81-cwt. B.L.R., 10 M., 2 l.	2 l. car.	13·00	470	5400
Sloop . .	**Cormorant**	.	*Comp.*	1130	950	15	3	170	0	36	0	Chatham .	Humphrys	1877	37,630	11,587	2	90-cwt. M.L.R., 4 64-cwt., 64-pdr. M.L.R., 4 M., 1 l.	..	11·31	150	1500
Cruiser . . (3rd class)	**Cossack**	2 *s.*	Steel	1770	3500	14	3½	225	0	36	0	Glasgow .	Thomson .	1886	*x* 55,916	*y* 31,667	6	6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00	325	4850
Cruiser . P. (1st class)	**Crescent** .	2 *s.*	Steel copper sheathed	7700	12,000	23	9	360	0	60	0	Portsm'th	Penn .	Bldg.	Total. 372,896		1	9·2-in. 22-ton B.L.R., 12 6-in. Q.F., 17 6-pdr. and 3-pdr. do., 8 M., 2 l.	4 f. tu. or l. car	19·5	850	10,000
Cruiser, . pp. (3rd class)	**Curaçoa** .	.	Steel copper sheathed	2380	2540	19	3	225	0	44	6	Glasgow .	Humphrys	1878	85,833	27,098	4	6-in. 5-ton B.L.R., 8 5-in. 40-cwt. do., 1 3-pdr. Q.F., 9 M., 2 l.	2 l. car.	13·00	470	3280
Gun Vessel . (1st class)	**Curlew** .	2 *s.*	Steel	950	1500	10	6	195	0	28	0	Devonp'rt	Penn .	1886	*x* 37,363	*y* 12,600	1	6-in. 5-ton B.L.R., 3 5-in. 38-cwt. B.L.R., 7 M.	1 b. tu. 4 l. car.	14·5	250	10,000
Sloop . .	**Daphne** .	2 *s.*	*Comp.*	1140	2000	11	6	195	0	28	0	Sheerness	Greenock F'ndry Co.	1888	*x* 42,400	*y* 15,200	8	5-inch 40-cwt. B.L.R., 8 M. .	..	14·5	160	..
Surveying Vessel	**Dart** . .	.	Wood	470	200	11	6	133	0	25	2	Barrow .	Barrow .	..	Purchased Total. 6,900		2 M., 2 l.		..	..	64	..
Sloop . .	**Dolphin** .	.	*Comp.*	925	720	14	0	157	0	32	0	Middl'sbro	Hawthorn .	1882	25,850	9,800	2	6-in. 81-cwt. B.L.R., 2 5-in. 36-cwt. B.L.R., 3 M., 1 l.	..	11·30	135	1700
„ . .	**Dragon** .	.	*Comp.*	1130	1010	15		170	0	36	0	Devonp'rt	Maudslay .	1878	36,427	13,069	2	90-cwt. M.L.R., 4 64-pdr. do., 4 M., 1 l.	..	11·52	150	1480

x Includes Gun Mountings, &c. *y* Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp., composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo-tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		f. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Cruiser . P. (1st class)	Edgar . 2 *s.*	Steel	7350	12,000	23 9	360 0	60 0	Devonp'rt	Elder .	1890	Total. 373,548		2 9·2-in. 22-ton B.L.R., 10 6-in. Q.F., 16 6-pdr. do., 3 3-pdr. do., 8 M.	4 f. tu. or l.car	19.75	850	10,000
Sloop . .	Egeria (Surveying Service).	*Comp.*	940	1010	14 3	160 0	31 4	Pembroke	Humphrys	1873	32,468	10,414	4 20-pdr. B.L.R., 2 M., 1 l. .	..	11·30	100	1000
Gun Vessel .	Elk (Coast Guard Service) . 2 *s.*	*Comp.*	603	470	8 9	155 0	25 0	Portsm'th	Penn .	1868	16,107	5,775	1 90-cwt. M.L.R., 1 64-pdr. M.L.R., 2 20-pdr., 2 M.	..	9·25	100	..
Cruiser . . (3rd class)	Emerald . .	*Comp.*	2120	2170	19 0	220 0	40 0	Pembroke	Thomson .	1876	72,312	26,130	4 6-in. 81-cwt. B.L.R., 8 5-in. 38 cwt. do., 7 M., 2 l.	..	13·20	250	2280
Cruiser . P. (1st Class)	Endymion 2 *s.*	Steel	7350	12,000	23 9	360 0	60 0	Hull .	Earle .	Bldg.	Total. 344,202		2 9·2-in. 22-ton B.L.R., 10 6-in. Q.F., 12 6-pdr., do., 3 3-pdr. do., 8 M., 2 l.	4 f. tu. or l.car	19·75	850	10,000
Sloop . .	Espiegle . .	*Comp.*	1130	1140	16 3	170 0	36 0	Devonp'rt	Maudslay .	1880	37,000	11,770	10 5-in. 40-cwt. B.L.R., 8 M., 1 l.	..	11·5	150	1480
Gun Boat . . (2nd class)	Espoir . .	*Comp.*	465	470	10 0	125 0	23 6	Barrow .	Barrow .	..	..	..	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·8	40	..
Cruiser . . (2nd class)	Euryalus . .	Iron zinc sheathed	4140	5110	25 3	280 0	45 6	Chatham.	Easton and Anderson	1877	132,254	76,959	2 6-in. B.L.R., 12 90-cwt. M.L.R., 4 Q.F., 11 M., 3 l.	2 l. car.	14·72	550	2080
Gun Vessel .	Falcon (Harbour Service).	*Comp.*	780	720	13 0	157 0	29 6	Birkenh'd	Laird .	1877	25,763	10,805	1 90-cwt. M.L.R., 2 64-pdr. do., 2 M., 1 l.	..	10·70	120	1990

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Cruiser (3rd class)		Fearless	2 *s.*	Steel	1580	3200	14	6	220	0	34	3	Barrow	Barrow	1886	*x*64,202	23,250	4	5-in. 40-cwt. B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	3 f. tu. 4 l. car.	17·27	450	6900
Gun Boat (2nd class)		Firebrand		*Comp.*	455	460	10	0	125	0	23	6	Glasgow	Thomson	1877	16,500	6,300	2	5-in. 38-cwt. B.L.R., 2 4-in. 22-cwt. do., 2 M.	..	10·17	40	..
„ „		Firefly		*Comp.*	455	470	10	0	125	0	23	6	Glasgow	Thomson	1877	16,400	6,300	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·99	40	..
„ „		Firm		*Comp.*	455	510	10	0	125	0	23	6	Hull	Earle	1877	16,550	6,080	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	10·2	40	..
Gun Vessel (2nd class)		Flamingo		*Comp.*	780	750	12	11	157	0	29	6	Devonp'rt	Elder	1876	25,774	9,228	2	5-in. 38-cwt. B.L.R., 2 64-pdr., 6 M.	..	11·00	130	1170
Cruiser (2nd class)	P.	Flora		Steel copper sheathed	4360	9000	19	0	320	0	49	6	Pembroke	..	Bldg.	..	..	2	6-in. Q.F., 8 4·7-in. do., 9 6-pdr. and 3-pdr. do.	..	19·5	400	..
Gun Boat (2nd class)		Forester		*Comp.*	455	480	10	0	125	0	23	6	Earle	Earle	1877	16,500	6,100	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	10·1	40	..
Cruiser (2nd class)	P.	Forte		Steel copper sheathed	4360	9000	19	0	320	0	49	6	Chatham	Chatham	Bldg.	..	..	2	6-in. Q.F., 8 4·7-in. do., 9 6-pdr. and 3-pdr. do.	..	19·5	400	..
„ „		Forth	2 *s.*	Steel	4050	5700	20	0	300	0	46	0	Pembroke	Hawthorn	1886	151,952	50,000	2	8-inch 15-ton B.L.R., 10 6-in. 5-ton B.L.R., 5 Q.F., 9 M., 2 l.	2 l. car.	18·00	900	8750
Gun Boat (2nd class)		Forward		*Comp.*	455	450	10	0	125	0	23	6	Barrow	Hawthorn	1877	14,100	6,400	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·4	40	..
Cruiser (2nd class)	P.	Fox		Steel copper sheathed	4360	9000	19	0	320	0	49	6	Portsm'th	Portsm'th	Bldg.	..	..	2	6-in. Q.F., 8 4·7-in. do., 9 6-pdr. and 3-pdr. do.	..	19·5	400	..
Gun Boat (2nd class)		Foxhound		*Comp.*	455	470	10	0	125	0	23	6	Barrow	Hawthorn	1877	14,150	6,550	2	64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·6	40	..
Gun Vessel		Frolic (Volunteer Drill Ship.)	*s.*	*Comp.*	610	900	9	6	155	0	25	0	Chatham	Penn	1872	16,512	6,593	1	90-cwt. M.L.R., 3 64-pdr. do., 2 20-pdr. B.L.R., 2 M.	..	10·70	80	880
Sloop		Garnet		*Comp.*	1130	1110	15	9	170	0	36	0	Sheerness	Humphrys	1878	39,581	12,889	2	90-cwt. M.L.R., 3 64-pdr. do., 2 5-in. 38-cwt. B.L.R., 6 M., 1 l.	..	11·53	150	1480

x Includes Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp. composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Cruiser . . (3rd class)	Garnet . .	*Comp.*	2120	2000	19 7	220 0	40 0	Chatham.	Hawthorn.	1877	64,689	27,779	14 5-in. 40-cwt. B.L.R., 7 M., 2 l.	..	13·00	260	2000
Cruiser . P. (1st class)	Gibraltar . 2 *s.*	Steel copper sheathed	7700	12,000	23 9	360 0	60 0	Glasgow .	Napier .	Bldg.	Total. 340,005		2 9-in. 22-ton B.L.R., 10 6-in. Q.F., 12 6-pdr. do., 3 3-pdr. do., 8 M., 2 l.	4 f. tu. or l. car	19·5	850	10,000
1st Class Torpedo Gun Boat	Gleaner . .	Steel	735	4500	8 3	230 0	27 0	Sheerness	Sheerness	1890	Total. 54,406		2 4·7-in. Q.F., 4 3-pdr. do. .	1 f. tu. 2 l. car.	21·0	100	2500
Gun Boat . . (1st class)	Goldfinch . .	*Comp.*	805	1200	11 7½	165 0	31 0	Sheerness	Sheerness	1889	Total. 40,889		6 4-in. 25-cwt. B.L.R., 2 3-pdr. Q.F., 2 M.	..	13·0	105	2500
Gun Boat . . (2nd class)	Goshawk . .	*Comp.*	430	480	10 0	125 0	22 6	Pembroke	Maudslay .	1872	10,550	3,870	2 6·4-in. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	10·24	40	..
1st Class Torpedo Gun Boat	Gossamer . .	Steel	735	4500	8 3	230 0	27 0	Sheerness	Sheerness	1890	Total. 54,490		2 4·7-in. Q.F., 4 3-pdr. do. .	1 f. tu. 2 l. car.	21·0	100	2500
Cruiser . P. (1st class)	Grafton . 2 *s.*	Steel	7350	12,000	23 9	360 0	60 0	Blackwall	Humphrys	Bldg.	Total. 341,026		2 9·2-in. 22-ton B.L.R., 10 6-in. Q.F., 12 6-pdr. do., 4 3-pdr. do, 8 M., 2 l.	4 f. tu. or l. car	19·75	850	10,000
Gun Boat . . (2nd class)	Grappler . .	*Comp.*	465	440	10 0	125 0	23 6	Barrow .	Barrow .	1880	15,600	5,250	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 3 M.	..	9·8	..	..

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1st Class Torpedo Gun Boat	**Grasshopper**	2 *s.*	Steel	525	3000	8	9	200	0	23	0	Sheerness	Maudslay	1887	*x*20,897	*y*13,168	1 4-in. 25-cwt. B.L.R., 6 3-pdr. Q.F.	2 f. tu. 2 l. car.	19·00	80	2400
Gun Vessel (2nd class)	**Griffon**		*Comp.*	780	790	13	2	157	0	29	6	Birkenh'd	Laird	1876	25,330	10,794	2 5-in. 38-cwt. B.L.R., 2 64-pdr. do., 6 M.	..	10·87	120	1990
1st Class Torpedo Gun Boat	**Halcyon**	2 *s.*	Steel	810	3500	8	9	230	0	27	0	Devonp'rt	..	Bldg.	..	..	2 4·7 in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	19·25	100	2500
Cruiser . P. (1st class)	**Hawke**	2 *s.*	Steel	7350	12,000	23	9	360	0	60	0	Chatham.	Elder	1891	Total. 361,944		2 9·2-in. 22-ton B.L.R., 10 6-in. Q.F., 12 6-pdr. do., 3 3-pdr. do., 8 M.	..	19·75	850	10,000
1st Class Torpedo Gun Boat	**Hebe**	2 *s.*	Steel	810	3500	8	9	230	0	27	0	Sheerness	Sheerness	Bldg.	..	..	2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	19.25	100	2500
Torpedo Depôt Ship.	**Hecla**		Iron.	6400	2260	24	3	391	7	38	9	(Purchased) Built and Engined by Harland & Wolff.		1878	Total. 126,190		4 64-pdr. M.L.R., 1 5-in. 38-cwt. B.L.R, 1 40-pdr. B.L.R., 14 M.	4 f. tu. or l. car.	11·7	2,200	26,400
Cruiser . P. (2nd class)	**Hermione**		Steel copper sheathed	4360	9000	19	0	320	0	49	6	Devonp'rt	Devonport	Bldg.	..	..	2 6-in. Q.F., 8 4·7-in. do., 9 6-pdr. and 3-pdr. do.	..	19·5	400	..
Cruiser . pp. (3rd class)	**Heroine**		*Comp.*	1420	1130	15	9	200	0	38	0	Devonp'rt	Humphrys.	1881	52,500	14,500	8 6-in. 81-cwt. B.L.R., 4 M., 1 l.	..	13·11	400	6000
„ „ „	**Hyacinth**		*Comp.*	1420	1190	15	9	200	0	38	0	Devonp'rt	Humphrys.	1881	52,500	14,500	8 6-in. 81-cwt. B.L.R. 4 M., 1 l.	..	13·10	400	6000
Sloop . .	**Icarus**		*Comp.*	970	1230	13	6	167	0	32	0	Devonp'rt	Barrow	1886	*x*39,369	*y*12,735	8 5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	12·5	150	2300
Cruiser . . (2nd class)	**Inconstant**		Iron copper sheathed	5780	7360	25	6	337	4	50	3	Pembroke	Penn	1868	138,585	74,739	10 9-in. 12-ton M.L.R., 6 7-in. 6½-ton M.L.R., 6 20-pdr. B.L.R., 2 Q.F., 11 M., 2 l.	2 l. car.	16·20	750	2780
„ „ P.	**Indefatigable**	2 *s.*	Steel copper sheathed	3600	9000	17	6	300	0	43	8	Glasgow .	London and Glasgow	1891	Total. 180,700		2 6-in. 5-ton B.L.R., 6 4·7-in. Q.F., 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·75	400	8000
„ „ „	**Intrepid**	2 *s.*	Steel copper sheathed	3600	9000	17	6	300	0	43	8	Glasgow .	London and Glasgow	1891	Total. 180,699		2 6-in. 5 ton B.L.R., 6 4·7-in. Q.F., 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·75	400	8000

x Includes Gun Mountings, &c.

Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp., composite hull; 2 *s.* two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun: Q F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns: f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp. partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Discharger.		Coal that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.								kn ts.	tons.	knots.
Cruiser . P. (2nd class)	**Iphigenia** . 2 *s.*	Steel copper sheathed	3600	9000	17 6	300 0	43 8	Glasgow .	London and Glasgow	1891	Total. 180,738		2 6-in. 5-ton B.L.R., 6 4·7-in. Q.F., 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·75	400	8000
„ „ .	**Iris** . . 2 *s.*	Steel	3730	7330	22 0	300 0	46 0	Pembroke	Maudslay .	1877	110,868	102,318	13 5-in. 2-ton B.L.R., 4 Q.F., 7 M., 1 l.	4 l. car.	18·0	780	4400
1st Class Torpedo Gun Boat	**Karrakatta** (Special for Australia) 2 *s.*	Steel	735	4500	8 3	230 0	27 0	Elswick .	Bellis .	1890	*x* 26,456	*y* 21,193	2 4·7-in. Q.F., 4 other do. .	1 f. tu. 2 l. car.	21·0	100	2500
Cruiser . P. (3rd class)	**Katoomba** (Special for Australia)	Steel	2575	7500	15 6	265 0	41 0	Elswick .	Hawthorn	1889	Total. 116,719		8 4·7-in. Q.F., 8 3-pdr. do., 4 M., 1 l.	2 f. tu. 2 l. car.	19·0	300	4800
Sloop . .	**Kingfisher** .	*Comp.*	1130	1090	15 9	170 0	36 0	Sheerness	Maudslay .	1879	39,300	11,850	2 90-cwt. M.L.R., 4 64-pdr. do. 4 M., 1 l.	..	11·60	150	1480
Gun Vessel . (1st class)	**Landrail** . 2 *s.*	Steel	950	1500	10 6	195 0	28 0	Devonp'rt	Penn .	1886	37,363	12,600	1 6-in. 5-ton B.L.R., 3 5-in. 38-cwt. B.L.R., 7 M.	1 b. tu. 4 l. car.	14·5	250	10,000
Gun Boat . . (1st class)	**Lapwing** . .	*Comp.*	805	1200	11 7½	165 0	31 0	Devonp'rt	Devonport	1889	Total. 39,952		6 4-in. 25-cwt. B.L.G., 2 3-pdr. Q.F., 2 M.	..	13·0	105	2500
Cruiser . P. (2nd class)	**Latona** . 2 *s.*	Steel	3400	9000	16 6	300 0	63 0	Barrow .	Barrow .	1890	Total. 172,722		2 6-in. 5-ton B.L.R., 6 4·7 in. Q.F., 9 other do., 4 M., 1 l.	4 f. tu. or l. car	20·0	400	8000

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Cruiser (2nd class)	pp.	**Leander**	2 *s.*	Steel	4300	5500	20	6	300	0	46	0	Glasgow	Napier	1882	87,843 estim'td	60,610 estim'td	10	6-in. 5-ton. B.L.R., 4 Q.F., 14 M., 2 l.	4 l. car.	17·00	1000	11,000
1st Class Torpedo Gun Boat		**Leda**	2 *s.*	Steel	810	3500	8	9	230	0	27	0	Sheerness	Penn	Bldg	..	..	2	4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	19·25	100	..
Gun Vessel (2nd class)		**Linnet**	2 *s*	*Comp.*	756	1050	10	11	165	0	29	0	Blackwall	Rennie	1880	25,281	10,382	2	90-cwt. M.L.R., 3 20-pdr. B.L.R., 2 M.	..	11·80	180	2400
Gun Boat (1st class)		**Lizard**		*Comp.*	715	1000	11	10	165	0	29	0	Belfast	Harland	1887	42,770	10,000	6	4-in. 25-cwt. B.L.R., 4 M.	..	13·00	105	2500
Cruiser (3rd class)	P.	**Magicienne**		Steel copper sheathed	2950	9000	17	6	265	0	42	0	Glasgow	Hawthorn	1888	Total. 136,000		6	6-in. 5-ton B.L.R., 10 Q.F., 3 M., 1 l.	2 f. tu. 4 l. car.	19·75	400	8000
Gun Boat (1st class)		**Magpie**		*Comp.*	805	1200	11	7½	165	0	31	0	Pembroke	Earle	1889	*x* 29,400	*y* 9,300	6	4-in. 25-cwt. B.L.R., 4 M.	..	13·0	5 10	2500
Cruiser (3rd class)	P.	**Marathon**		Steel copper sheathed	2950	9000	17	6	265	0	42	0	Glasgow	Hawthorn	1888	Total. 136,000		6	6-in. 5-ton B.L.R., 10 Q.F., 3 M., 1 l.	2 f. tu. 4 l. car	19·75	400	8000
Sloop Gunboat		**Mariner**		*Comp.*	970	970	14	0	167	0	32	0	Devonp'rt	Hawthorn.	1884	37,156	12,841	8	5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	11·50	150	2300
Cruiser (3rd class)	P.	**Medea**	2 *s.*	Steel	2800	9000	16	6	265	0	41	0	Chatham	Humphrys	1888	*x* 88,400	*y* 53,300	6	6-in. 5-ton B.L.R., 10 Q.F., 3 M. 1 l.	2 f. tu. 4 l. car	20·00	400	8000
„ „	P.	**Medusa**	2 *s.*	Steel	2800	9000	16	6	265	0	41	0	Chatham	Humphrys	1888	*x* 88,400	*y* 53,300	6	6-in. 5-ton B.L.R., 10 Q.F., 3 M. 1 l.	2 f. tu. 4 l. car	20·00	400	8000
Cruiser (2nd class)	P.	**Melampus**	2 *s.*	Steel	3400	9000	16	6	300	0	43	0	Barrow	Barrow	1891	Total. 172,695		2	6-in. B.L.R., 6 4·7 in. Q.F., and 9 other do., 4 M., 1 l.	2 f. tu. 4 l. car.	20·0	400	8000
Sloop		**Melita**		*Comp.*	970	1200	13	6	167	0	32	0	Malta	Malta Dock Yard	1888	Total. 60,179		8	5-in. 40-cwt. B.L.R., 8 M., 1 l.	..	12·50	150	2100
Cruiser (3rd class)	P.	**Melpomene**	2 *s.*	Steel copper sheathed	2950	9000	17	6	265	0	41	0	Portsm'th	Palmer Co.	1888	*x* 92,000	*y* 50,000	6	6-in. 5-ton B.L.R., 10 Q.F., 3 M., 1 l.	2 f. tu. 4 l. car	19·75	400	8000
Cruiser (2nd class)		**Mercury**	2 *s.*	Steel	3730	7290	22	0	300	0	46	0	Pembroke	Maudslay	1878	119,452	93,800	13	5-in. 40-cwt. B.L.R., 4 Q.F., 7 M., 1 l.	4 l. car.	18·00	780	4950

x Includes Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp. composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots:
Gun Boat . . (2nd class)	Merlin . . (non-effective)	*Comp.*	430	430	9 6	125 0	22 6	Pembroke	Watt .	1871	10,4 00	3,800	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·5	40	..
Cruiser . P. (2nd class)	Mersey . 2 *s.*	Steel	4050	6000	19 6	300 0	46 0	Chatham.	Humphrys.	1885	100,000 estim'td	54,000 estim'td	2 8-in. 15 ton B.L.R., 10 6-in. 5-ton B.L.R., 5 Q.F., 9 M., 2 l.	2 tu. sub 2 l. car.	18·00	900	8750
											Total. 116,062						
Cruiser . P. (3rd class)	Mildura (Special for Australia) 2 *s.*	Steel	2575	7500	15 6	265 0	41 0	Elswick .	Hawthorn.	1889			8 4·7-in. Q.F., 8 3-pdr. do., 4 M., 1 l.	2 f. tu. 2 l car.	19·0	300	4800
Sloop . .	Miranda . .	*Comp.*	1130	1020	15 9	170 0	36 0	Devonp'rt	Napier .	1879	37,000	11,700	2 7-in. 90-cwt. M.L.R., 4 64-pdr. do., 4 M., 1 l.	..	11·50	150	1480
Gun Boat . . (2nd class)	Misletoe . .	*Comp.*	560	650	13 4	135 0	26 0	Birkenh'd	Laird .	1883	18,000	8,500	2 5-in. 38-cwt., B.L.R., 2 4-in. 22 cwt. do., 2 M., 2 l.	..	10·7	95	..
Cruiser . . (3rd class)	Mohawk 2 *s.*	Steel	1770	3500	14 6	225 0	36 0	Glasgow .	Thomson .	1886	*x*55,916	*y*31,667	6 6-in. 5-ton B.L.R., 8 Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00	475	7000
Sloop . .	Mutine . .	*Comp.*	1130	1120	15 9	170 0	36 0	Devonp'rt	Maudslay .	1880	37,500	11,770	10 5-in. 40-cwt. B.L.R., 8 M., 1 l.	..	12·10	150	1480
											Total. 172,802						
Cruiser . P. (2nd class)	Naiad . 2 *s.*	Steel	3400	9000	16 6	300 0	43 0	Barrow .	Barrow .	1891			2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 2 l.	4 f. tu. or l. car	20·0	400	8000
Sloop . .	Nymphe . .	*Comp.*	1140	2000	12 6	195 0	28 0	Portsm'th	Greenock F'ndry Co.	1888	*x*42,400	*y*15,200	8 5-in. 40-cwt. B.L.R. 8 M. .	..	14·50	160	3000
Cruiser . . (3rd class)	Opal . . .	*Comp.*	2120	2190	18 7	220 0	40 0	Sund'land	Napier .	1875	68,574	27,375	12–64-pdr. 64 cwt. M.L.R., 6 M., 2 l. .	..	13·4	270	2250

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																Total.					
Cruiser (3rd class)	P.	Pallas	2 s.	Steel	2575	7500	15	6	265	0 41	0	Portsm'th	Hawthorn.	1891		147,864	8	4·7-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·0	300	4800
Gun Boat (1st class)	.	Partridge	.	Comp.	755	1200	11	4	165	0 30	0	Devonp'rt	Devonport	1888	27,800	10,000	6	4-in. 25-cwt. B.L.R., 4 M.	..	13·25	105	2500
„ „	.	Peacock	.	Comp.	755	1200	11	4	165	0 29	0	Pembroke	Barrow Co.	1888	27,600	10,000	6	4-in. 25 cwt. B.L.R., 4 M.	..	13·25	105	2500
																Total.					
Cruiser (2nd class)	P.	Pearl	2s.	Steel	2575	7500	15	6	265	0 41	0	Pembroke	Thomson	1891		145,940	8	4·7-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	2 f. tu. 2 l. car.	19·0	300	4800
Sloop	.	Pegasus	.	Comp.	1130	970	15	9	170	0 36	0	Devonp'rt	Laird	1878	36,697	12,809	2	90-cwt. M.L.R., 4 64-pdr. do., 4 M., 1 l.	..	11·47	150	1750
„	.	Pelican	.	Comp.	1130	1060	15	3	170	0 36	0	Devonp'rt	Humphrys.	1877	41,282	14,939	2	6-in. 5-ton B.L.R., 6 5-in. 38-cwt. B.L.R., 4 M., 1 l.	..	12·00	150	1480
„	.	Penguin	.	Comp.	1130	1110	16	1	170	0 36	0	Glasgow	Hawthorn.	1876	39,611	12,500	2	90-cwt. M.L.R., 2 5-in. 38-cwt. B.L.R., 3 64-pdr. M.L.R., 4 M., 1 l.	..	11·00	150	1500
Cruiser (2nd class)	pp.	Phaeton	2 s.	Steel	4300	5500	20	6	300	0 46	0	Glasgow	Napier	1883	86,763	58,435	10	6-in. 5-ton B.L.R., 16 M., 2 l.	4 l. car.	17·00	1000	11,000
Gun Boat (1st class)	.	Pheasant	.	Comp.	755	1200	11	4	165	0 29	0	Devonpo't	Devonport	1888	x27,800	y10,000	6	4-in. 25 B.L.R., 4 M.	..	13·25	105	2500
																Total.					
Cruiser (3rd class)	P.	Philomel	.	Steel	2575	7500	15	6	265	0 41	0	Devonpo't	Earle	1891		152,565	8	4·7-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	2 f. tu. 2 l. car.	19·0	300	4800
																Total.					
„ „	„	Phœbe	2 s.	Steel	2575	7500	15	6	265	0 41	0	Devonpo't	Devonport	1891		151,344	8	4·7-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	2 f. tu. 2 l. car.	19·0	300	4800
Gun Boat (1st class)	.	Pigeon	.	Comp.	755	1200	11	4	165	0 30	0	Pembroke	Barrow	1888	x27,800	y10,000	6	4-in. B.L.R., 4 M.	..	13·25	105	2500
„ „	.	Pigmy	.	Comp.	755	1200	11	4	165	0 30	0	Sheerness	Barrow	1888	28,000	9,700	6	4-in. 25-cwt. B.L.R., 4 M.	..	13·25	105	2500
																Total.					
Cruiser (2nd class)	P.	Pique	2 s.	Steel copper sheathed	3600	9000	17	6	300	0 43	8	Jarrow	Palmer	1891		184,634	2	6-in. 5-ton B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·75	400	8000
Gun Boat (1st class)	.	Plover	.	Comp.	755	1200	11	4	165	0 30	0	Pembroke	Barrow	1888	28,000	9,700	6	4-in. 25 B.L.R., 4 M.	..	13·25	105	2500

x Includes Gun Mountings, &c. y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp. composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Ma-chinery.	Guns.	Fish Torpedo Dis-chargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		f in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Torpedo Ram, P.	**Polyphemus** 2 *s.*	Steel	2640	5520	20 0	240 0	40 0	Chatham.	Humphrys.	1881	114,000	60,450	6 6-pdr. Q.F., 2 M. . .	5 f. tu. subm.	17·80	300	3400
Cruiser . . (3rd class)	**Porpoise** 2 *s.*	Steel	1770	3500	14 6	225 0	36 0	Glasgow .	Thomson .	1886	*x*55,916	*y*31,667	6 6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu.	17·00	475	7000
„ „ pp.	**Pylades** . .	*Comp.*	1420	1640	15 9	200 0	38 0	Sheerness	Laird .	1884	45,500	16,500	14 5-in. 38-cwt. B.L.R., 8 M., 1 l.	..	13·00	400	6400
Sloop . .	**Racer** . .	*Comp.*	970	920	14 0	167 0	32 0	Devonp'rt	Hawthorn.	1884	37,000	12,000	8 5-in. 38 cwt. B.L.R., 8 M., 1 l.	..	11·50	150	2300
Cruiser . . (3rd class)	**Racoon** . 2 *s.*	Steel	1770	4500	13 6	225 0	36 0	Devonp'rt	Harland .	1887	*x*60,606	*y*31,000	6 6-in. 5-ton B.L.R., 8 Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·00	475	7000
Cruiser . P. (2nd class)	**Rainbow** . 2 *s.*	Steel copper sheathed	3600	9000	17 6	300 0	43 8	Jarrow .	Palmer .	1891	Total. 184,640		2 6-in. 5-ton B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·75	400	8000
„ „ „	**Raleigh** . .	Iron copper sheathed	5260	5640	24 7	298 0	49 0	Chatham.	Humphrys.	1873	147,248	46,138	8 90-cwt. M.L.R., 8–6-in. 81-cwt., B.L.R., 8 5-in. 38-cwt. do., 12 M., 4 l.	2 l. car.	15·50	550	2100
Gun Vessel . (2nd class)	**Rambler** (Surveying service).	*Comp.*	835	690	13 7	157 0	29 6	Glasgow .	Elder .	1880	26,625	10,413	4 20-pdr. B.L.R., 1 M., 1 l. .	..	10·66	40	1050
„ „ .	**Ranger** . .	*Comp.*	835	760	13 7	157 0	29 6	Glasgow .	Elder .	1880	26,558	10,710	1 90-cwt. M.L.R., 2 64-pdr. do., 2 M., 1 l.	..	10·95	110	1500

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Cruiser . pp. (3rd class)	**Rapid** . .		*Comp.*	1420	1400	15	9	200	0	38	0	Devonp'rt	Maudslay .	1883	52,107	16,119	2 6-in. 81-cwt. B.L.R., 10 5-in. 38-cwt. do., 4 M., 1 l.	..	13·10	400	6000
Gun Boat . . (1st class)	**Rattler** . .		*Comp.*	715	1200	11	0	165	0	29	0	Elswick .	Hawthorn.	1886	*x* 28,134	*y* 10,600	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·0	105	2500
1st Class Torpedo Gunboat	**Rattlesnake**	2 *s.*	Steel	550	2700	8	0	200	0	23	0	Birkenh'd	Laird	1886	*x* 21,425	*y* 14,000	1 4-in. 25-cwt. B.L.R., 6 3-pdr. Q.F.	2 f. tu. 2 l. car.	18·5	100	3050
Gun Boat . . (2nd class)	**Raven** . .		*Comp.*	465	380	10	0	125	0	23	6	Poplar .	Rennie .	1882	14,800	6,250	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·5	40	..
Gun Vessel . (2nd class)	**Ready** .	2 *s.*	*Comp.*	610	890	9	10	155	0	25	0	Chatham.	Penn .	1872	17,231	6,613	1 7-in. 6½-ton M.L.R., 1 64-pdr. do., 2 20-pdr. B.L.R., 2 M.	..	11·10	80	880
Gun Boat . . (1st class)	**Redbreast** . .		*Comp.*	805	1200	11	7½	165	0	31	0	Pembroke	Earle .	1888	29,400	9,300	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·0	105	2500
„ „ . .	**Redpole** . .		*Comp.*	805	1200	11	7½	165	0	31	0	Pembroke	Earle .	1888	29,400	9,300	6 4-in. 25-cwt. B.L.R., 4 M.	..	13·0	105	2500
Gun Boat . . (2nd class)	**Redwing** . .		Tender	461	440	10	0	125	0	23	6	Pembroke	Maudslay .	1880	16,400	5,800	2 20-in. B.L.R., 2 M.	..	9·68	40	..
Sloop . .	**Reindeer** . .		*Comp.*	970	1030	14	0	167	0	32	0	Devonp'rt	Hawthorn.	1883	34,834	52,787	6 5-in. 36-cwt. do., 8 M., 1 l. .	..	11·50	150	3200
Cruiser . P. (2nd class)	**Retribution**	2 *s.*	Steel copper sheathed	3600	9000	17	6	300	0	43	8	Jarrow .	Palmer .	1891	Total. 184,648		2 6-in. 5-ton B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·75	400	8000
Cruiser . P. (3rd class)	**Ringarooma** (Special for Australia)	2 *s.*	Steel	2575	7500	15	6	265	0	41	0	Glasgow .	Thomson .	1890	Total. 128,076		8 4·7-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·00	300	4800
Gun Boat . . (1st class)	**Ringdove** . .		*Comp.*	805	1200	11	7½	165	0	31	5	Devonp'rt	Devonport	1889	Total. 39,753		6 4-in. 25 cwt. B.L.R., 2 3-pdr. Q.F., 2 M.	..	13·0	105	2500
Cruiser . . (2nd class)	**Rover** . .		Iron zinc sheathed	3460	4960	23	0	280	0	43	6	Blackwall	Ravenhill .	1874	104,718	65,021	14 6-in. 81-cwt. B.L.R., 8 M., 3 l.	2 l. car.	14·53	410	1840
Cruiser . P. (1st class)	**Royal Arthur,** (was Centaur)	2 *s.*	Steel copper sheathed	7700	12000	23	9	360	0	60	0	Portsm'th	Maudslay .	1891	Total. 377,230		1 9·2-in. 22-ton B.L.R., 12 6-in. Q.F., 17 6-pdr. and 3-pdr. do., 8 M.	4 f. tu. or l. car	19·5	850	10,000

x Includes Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp. composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.				£	£			knots.	tons.	knots.
Cruiser . pp. (3rd class)	Royalist . .	*Comp.*	1420	1510	15 9	200 0	38 0	Devonp'rt	Maudslay .	1883	52,134	16·039	2 6-in. 81-cwt. B.L.R., 10 5-in. 38-cwt. do. 4 M., 1 l.	..	13·10	400	6000
„ „ „	Ruby . .	*Comp.*	2120	1830	18 8	220 0	40 0	Hull .	Earle .	1876	66,113	27,003	12 64-pdr. M.L.R., 6 M., 2 l. .	..	12·28	260	2080
Cruiser . P. (1st class)	St. George. 2 *s.*	Steel copper sheathed	7700	12,000	23 9	360 0	60 8	Hull . .	Maudslay .	Bldg.	Total. 370,149		1 9·2-in. 22-ton B.L.R., 12 6-in. Q.F., 12 6-pdr. do., and 3-pdr. do., 8 M.	4 f. tu. or l. car	19·5	850	10,000
1st Class Torpedo Gun Boat	Salamander 2 *s.*	Steel	735	4500	8 3	230 0	27 0	Chatham .	Maudslay .	1889	Total. 57,911		2 4·7-in. Q.F., 4 3-pdr. Q.F. .	1 f. tu. 2 l. car.	21·0	100	2500
„ „	Sandfly . 2 *s.*	Steel	525	3000	8 9	200 0	23 0	Devonp'rt	Maudslay	1887	*x*22,877	*y*13,290	1 4-in. 25-cwt. B.L.R., 6 3-pdr. Q.F.	2 f. tu. 2 l. car.	19·00	80	2400
Cruiser . . (3rd class)	Sapphire . .	Wood	1970	2360	18 1	220 0	37 0	Devonp'rt	Hawthorn .	1874	51,986	26,311	12 64-pdr. M.L.R., 6 M., 2 l. .	..	13·58	270	2080
Cruiser . P. (2nd class)	Sappho . .	Steel	3400	9000	16 6	300 0	43 0	Poplar .	Penn .	Bldg.	*x*96,317	*y*66,139	2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	20·0	400	8000
Cruiser . pp. (3rd class)	Satellite . .	*Comp.*	1420	1400	15 9	200 0	38 0	Sheerness	Humphrys .	1881	47,500	15,400	8 6-in. 81-cwt. B.L.R., 4 M., 1 l.	..	13·10	400	6000
„ „ „	Scout . 2 *s.*	Steel	1580	3200	14 6	220 0	34 0	Glasgow .	Thomson .	1885	*x*63,916	*y*23,600	4 5-in. 40-cwt. B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	3 f. tu. 4 l. car.	17·00	450	6900
Cruiser . P. (2nd class)	Scylla . 2 *s.*	Steel	3400	9000	16 6	300 0	43 0	Poplar .	Penn .	Bldg.	Total. 174,105		2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	20·0	400	8000

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																Total.						
1st Class Torpedo Gun Boat	**Seagull** .	2 *s.*	Steel	735	4500	8	3	230	0	27	0	Chatham.	Maudslay .	1889		56,922		2 4·7-in. 4 3-pdr. Q.F. .	1 f. tu. 2 l. car.	21·0	100	2500
Cruiser . P. (2nd class)	**Severn** .	2 *s.*	Steel	4050	6000	19	6	300	0	46	0	Chatham.	Humphrys.	1885	*x* 151,681	*y* 60,940		2 8-in. 15-ton B.L.R., 10 6-in. 5-ton B.L.R., 5 Q.F., 9 M., 2 l.	1 tu. sub 2 l. car.	18·17	900	8750
„ „ „	**Shah** . . .		Iron copper sheathed	6250	7480	26	5½	334	0	52	0	Portsm'th	Ravenhill .	1873	177,912	57,333		2 9-in. 12-ton M.L.R., 16 7-in. 6½-ton do., 8 5-in. 38-cwt. B.L.R., 4 Q.F., 12 M., 4 l.	2 l. car.	16·20	890	6840
1st Class Torpedo Gun Boat	**Sharpshooter** .	2 *s.*	Steel	735	4500	8	3	230	0	27	0	Devonp'rt	Bellis .	1888	*x* 29,675	*y* 20,354		2 4·7-in. Q.F., 4 3-pdr. do. .	1 f. tu. 2 l. car.	21·00	100	2500
„ „	**Sheldrake.**	2 *s.*	Steel	735	4500	8	3	230	0	27	0	Chatham.	Maudslay .	1889		Total. 57,800		2 4·7-in. Q.F., 4 3-pdr. do. .	1 f. tu. 2 l. car.	21·00	100	2500
Cruiser . P. (2nd class)	**Sirius** .	2 *s.*	Steel copper sheathed	3600	9000	17	6	300	0	43	8	Elswick .	Maudslay .	1890		Total. 186,289		2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·75	400	8000
1st Class Torpedo Gun Boat	**Skipjack** .	2 *s.*	Steel	735	4500	8	3	230	0	27	0	Chatham.	Laird .	1889		Total. 59,531		2 4·7-in. Q.F., 4 3-pdr. do. .	1 f. tu. 2 l. car.	21·00	100	2500
„ „	**Spanker** .	2 *s.*	Steel	735	4500	8	3	230	0	27	0	Devonp'rt	Bellis .	1889		Total. 50,000		2 4·7-in. Q.F., 4 3-pdr. do. .	1 f. tu. 2 l. car.	21·00	100	2500
Gun Boat . . (1st class)	**Sparrow** . .		*Comp.*	805	1200	11	7½	165	0	31	0	Greenock	Greenock	1889		Total. 39,000		6 4-in. 25-cwt. B.L.R., 2 3-pdr Q.F., 2 M.	..	13·00	105	2500
Cruiser . P. (2nd class)	**Spartan** .	2 *s.*	Steel copper sheathed	3600	9000	17	6	300	0	43	8	Elswick .	Maudslay .	1891		Total. 186,286		2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	19·75	400	8000
1st Class Torpedo Gunboat	**Speedwell.**	2 *s.*	Steel	735	4500	8	3	230	0	27	0	Devonp'rt	Laird .	1889		Total. 52,000		2 4·7-in. Q.F., 4 3-pdr. do.	1 f. tu. 2 l. car.	21·00	100	2500
„ „	**Spider** .	2 *s.*	Steel	525	3000	8	9	200	0	23	0	Devonp'rt	Maudslay	1887	*x* 23,000	*y* 13,300		1 4-in. 25-cwt. B.L.R., 6 3-pdr. Q.F.	2 f. tu. 2 l. car.	19·00	80	2400
Gun Boat . . (2nd class)	**Starling** . .		*Comp.*	465	360	10	0	125	0	23	6	Poplar .	Rennie .	1882	14,850	6,250		2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·50	40	..
„ „	**Stork** (Surveying Vessel)		*Comp.*	465	350	10	0	125	0	23	6	Poplar .	Rennie .	1882	14,900	6,250		2 l., 1 M.	..	9·50	40	..

x Includes Gun Mountings, &c.

y Propelling Machinery.

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GREAT BRITAIN.—Unarmoured Cruising Ships, &c.—*continued.*

comp, composite hull; 2 *s.*, two screws; M.L.R., muzzle-loading rifled gun; B.L.R., breech-loading rifled gun; Q.F., quick-firing gun; M., machine gun; l., light guns under 15 cwt., including boats' guns; f. tu. or b. tu., fixed or bow torpedo tube; l. car., launching torpedo carriage; P., deck protected; pp., partial deck protected. The protecting decks in all these cases are at least one inch thick.

Class.	NAME.	Material of Hull.	Displacement.	Indicated Horse-Power.	Draught of Water.	Length.	Beam.	Where Built.	Maker of Engines.	Date of Launch.	Cost.		Armament.		Speed.	Coal Endurance.	
											Hull.	Machinery.	Guns.	Fish Torpedo Dischargers		Coals that can be carried in Bunkers.	Distance that can be steamed at 10 knots speed.
			tons.		ft. in.	ft. in.	ft. in.								knots.	tons.	knots.
Despatch Vessel.	Surprise 2 *s.*	Steel	1650	3030	14 0	250 0	32 6	Jarrow .	Palmer .	1885	*x*49,084	*y*29,680	4 5-in. 38-cwt. B.L.R., 4 6-pdr. Q.F., 2 M.	..	17·00	400	6450
Sloop . .	Swallow . 2 *s.*	*Comp.*	1130	1570	11 6	195 0	28 0	Sheerness	Rennie .	1876	44,797	15,000	8 5-in. 38-cwt. B.L.R., 8 M. .	..	13·50	280	5000
Gun Vessel . (2nd class)	Swift. . 2 *s.*	*Comp.*	756	1010	10 11	165 0	29 0	Blackwall	Rennie .	1879	24,290	10,380	2 90-cwt. M.L.R., 3 6-pdr. Q.F., 2 M.	..	11·81	180	2400
Gun Boat . . (2nd class)	Swinger . . *Comp.*		430	520	9 6	125 0	22 6	Pembroke	Humphrys	1872	10,600	3,900	2 64-in. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	10·38	40	..
Cruiser . P. (2nd class)	Sybille . 2 *s.*	Steel	3400	9000	16 6	300 0	42 0	Stephenson.	Hawthorn.	1890	Total. 175,004		2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	20·0	400	8000
Cruiser . . (3rd class)	Tartar . 2 *s.*	Steel	1770	3500	14 3½	225 0	36 0	Glasgow .	Thomson .	1886	*x*55,916	*y*31,667	6 6-in. 5-ton B.L.R., 8 3-pdr. Q.F., 2 M., 1 l.	1 f. tu. 2 l. car.	17·33	325	4850
„ „ P.	Tauranga (Special for Australia) 2 *s.*	Steel	2575	7500	15 6	265 0	41 0	Glasgow .	Thomson .	1889	Total. 128,101		8 4·7-in. Q.F., 8 3-pdr. Q.F., 4 M., 1 l.	1 f. tu. 2 l. car.	19·0	300	4800
Cruiser . P. (2nd class)	Terpsichore 2 *s.*	Steel	3400	9000	16 6	300 0	43 0	Glasgow .	Thomson .	1890	Total. 174,177		2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do.	4 f. tu. or l. car	20·0	400	8000
„ „ „	Thames . 2 *s.*	Steel	4050	5700	19 6	300 0	46 0	Pembroke	Penn .	1886	151,952	53,500	2 8-in. 15-ton B.L.R., 10 6-in. 5-ton B.L.R., 5 Q.F., 9 M., 2 l.	2 l. car.	18·00	900	8750

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Cruiser . P. (1st class)	**Theseus** .	2 *s.*	Steel	7350	12,000	23	9	360	0	60	0	Blackwall	Maudslay .	Bldg.	Total. 340,747		2 9·2-in. 22-ton. B.L.R., 10·6-in. Q.F., 12 6-pdr., and 4 3-pdr. do., 8 M.	4 f. tu. or l. car	19·75	850	10,000
Cruiser . P. (2nd class)	**Thetis** .	2 *s.*	Steel	3400	9000	16	6	300	0	43	0	Glasgow .	Thomson .	Bldg.	Total. 174,144		2 6-in. B.L.R., 6 4·7-in. Q.F., and 9 other do., 4 M., 1 l.	4 f. tu. or l. car	20·0	400	8000
Gun Boat . . (1st class)	**Thrush** . .		*Comp.*	805	1200	11	7½	165	0	31	0	Greenock	Greenock F'ndry Co.	1889	Total. 39,000		6 4-in. 25-cwt. B.L.R, 2 3-pdr. Q.F., 2 M.	..	13·00	105	2500
Cruiser . . (3rd class)	**Tourmaline** .		*Comp.*	2120	2000	18	8	220	0	40	0	Middl'sbro	Hawthorn.	1875	69,998	25,771	4 6-in. 89-cwt. B.L.R., 8 5-in. 38-cwt. do., 8 M., 2 l.	..	12·62	280	2000
Cruiser . P. (2nd class)	**Tribune** .	2 *s.*	Steel	3400	9000	16	6	300	0	43	0	Glasgow .	Thomson .	Bldg.	Total. 174,108		2 6-in. Q.F., 6 4·7-in. do., and 9 other do.	4 f. tu. or l. car	20·0	400	8000
Cruiser . . (3rd class)	**Turquoise.** .		*Comp.*	2120	1990	19	1	220	0	40	0	Hull .	Earle .	1876	68,089	27,458	12 64-pdr. M.L.R., 9 M., 2 l. .	..	12·32	280	2080
Torpedo Vessel .	**Vesuvius** .	2 *s.*	Iron	245	390	8	6	90	0	22	0	Pembroke	Maudslay .	1874	10,522	7,465	Nil	4 tu.	9·71	25	..
Cruiser . . (2nd class)	**Volage** . .		Iron copper sheathed	3080	4530	22	0	270	0	42	0	Blackwall	Ravenhill .	1874	91,817	41,000	10 6-in. 81-cwt. B.L.R., 2 64-pdr. M.L.R., 9 M., 2 l.	2 l. car.	15·30	420	1850
Torpedo (Depôt Ship). P.	**Vulcan** .	2 *s.*	Steel	6620	12000	23	0	350	0	58	0	Portsm'th	Humphrys	1889	Total. 317,023		8 4·7-in. Q.F., 12 3-in. Q.F. .	2 f. tu. 4 l. car.	20·0	1000	12,000
Cruiser . P. (3rd class)	**Wallaroo** (Special for Australia)	2 *s.*	Steel	2575	7500	15	6	265	0	41	0	Elswick	Hawthorn.	1889	Total. 115,995		8 4·7-in. Q.F., 8 3-in. Q.F., 4 M, 1 l.	1 f. tu. 2 l. car.	19·0	300	4800
Sloop . .	**Wanderer** .		*Comp.*	923	750	14	0	157	0	32	0	Middl'sbro	Hawthorn.	1883	25,850	9,800	2 6-in. 81-cwt. B.L.R., 2 5-in. 36-cwt. do., 2 M., 1 l.	..	11·30	135	1700
Gunboat . . (2nd class)	**Watchful** . .		*Comp.*	560	650	11	6	135	0	26	0	Birkenh'd	Lairds .	1883	Total. 32,527		2 5-in. 40-cwt. B.L.R., 2 4-in. 22-cwt. do., 2 M.	..	11·0	85	..
Gunboat . . (1st class)	**Widgeon** .	2 *s.*	*Comp.*	805	1200	11	7½	165	0	30	0	Pembroke	Rennie .	1889	Total. 39,315		6 4-in. 25-cwt. B.L R., 2 3-pdr. Q.F., 2 M.	..	13·00	105	2500
Sloop . .	**Wild Swan** .		*Comp.*	1130	1090	15	10	170	0	36	0	Glasgow .	Hawthorn.	1876	39,643	11,853	2 6-in. 81-cwt. B.L.R., 6 5-in. 38-cwt. do., 4 M., 1 l.	..	11·35	150	1120
Gunboat . . (2nd class)	**Wrangler** . .		*Comp.*	465	480	10	6	125	0	23	6	Barrow .	Barrow .	1880	17,267	5,460	2 64-pdr. M.L.R., 2 20-pdr. B.L.R., 2 M.	..	9·88	40	..

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Royal Naval Reserved Merchant Cruisers.

LIST OF VESSELS held by the Owners at the disposition of the Lords Commissioners of the Admiralty.

	Name.	Owners.	Length.	Breadth.	Maximum Draught of Water for the Admiralty List.	Gross Tonnage.	Indicated Horse-Power.	Average Ocean Speed.
			Feet.	Feet.	Feet.	Tons.		Knots.
With Subvention.	Etruria	Cunard Company	501·5	57·2	26	7,718	14,500	18½
	Umbria	" "	501·5	57·2	26	7,718	14,500	18½
	Aurania	" "	470	57·2	26	7,269	9,500	16½
	Victoria	Peninsular and Oriental Co.	466	52	22½	6,300	7,000	15¼*
	Britannia	" " "	466	52	22½	6,300	7,000	15¼*
	Oceana	" " "	466	52	22½	6,300	7,000	15¼*
	City of Paris	Inman and International Co.	525	63¼	24½	10,500	18,000	19
	City of New York	" " "	525	63¼	24½	10,500	18,000	19
	Majestic	White Star Company	565	58	..	10,000	17,000	19
	Teutonic	" "	565	58	..	10,000	17,000	19
	Britannic	" "	455	45·2	25	5,004	10,000	15
	Germanic	" "	455	45·2	25	5,008	5,300	15
	Adriatic	" "	437·2	40·9	23	3,888	5,200	14
	Celtic	" "	437·2	40·9	23	3,867	5,200	14
	Servia	Cunard Company	515	52·1	26	7,392	3,600	17
	Gallia	" "	430·1	44·6	24	4,809	3,600	15
	Arcadia	Peninsular and Oriental Co.	466	52	22½	6,300	7,000	15¼*
	Valetta	" " "	420·4	45·1	22½	4,911	5,000	15½
	Massilia	" " "	420·4	45·1	22½	4,908	5,000	15½
	Rome	" " "	430·1	44·4	22½	5,013	5,000	15
	Carthage	" " "	430·1	44·4	22½	5,013	5,000	15
	Ballarat	" " "	420·2	43	22½	4,752	4,500	14½
	Parramatta	" " "	420·2	43	22½	4,759	4,500	14½
	City of Berlin	Inman and International Co.	..	..	..	5,491	6,000	..
	City of Chicago	" " "	..	..	..	5,202	4,500	..

There are numerous ships on the Admiralty List complying with Admiralty conditions as to subdivision which have no national tie. They are suitable for receiving an armament, but there is no arrangement with Owners, except the promise of preference for occasional State employment.

* Average speed of Britannia between Brindisi and King George's Sound, Western Australia. The average ocean speed is higher than this.

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Smaller Vessels, Gunboats.

Smaller Vessels, &c.

Note.—Troop and store ships, yachts, armed tugs, special service and harbour-service vessels, training ships, coast guard vessels, and small surveying vessels are not included.

Paddle-wheel Vessels. — Alecto, Cockatrice, Enchantress (late Helicon), Pioneer, Sphinx, Vigilant, Research.

Twin Screw Gunboats (Iron).—Dee, Don, Esk, Medina, Medway, Sabrina, Slaney, Spey, Tay, Tees, Trent, Tweed, 363 tons; 320 to 410 I.HP.

Twin Screw Iron or Steel Gunboats (*Staunch Type*).—Ant, Arrow, Badger, Blazer, Bloodhound, Bonetta, Bouncer, Bulldog, Bustard, Comet, Cuckoo, Fidget, Gadfly, Griper, Hyæna, Insolent, Kite, Mastiff, Pickle, Pike, Pincher, Plucky, Scourge, Snake, Snap, Staunch, Tickler, Weasel, 180 to 254 tons; 130 to 270 I.HP.

Torpedo Boats.

First Class.

19 of about 85 feet in length, 28 tons displacement, and 350 to 500 I.HP., of about 18 to 20 knots speed. Nos. 1–15 and 17–20.

2 of about 100 feet in length, 40 tons displacement, and 350 to 500 I.HP. (at Esquimalt). Nos. 39 and 40.

4 of about 110 to 113 feet in length, 63 to 67 tons displacement, and about 18½ to 20½ knots speed. Nos. 21–24.

48 of about 125 feet in length, 60 to 66 tons displacement, and 750 I.HP., and about 21 knots speed. Nos. 25–33 and 41–79.

5 of about 125 feet in length, 85 tons displacement, and 750 I.HP. Nos. 34–38.

1 of about 135 feet in length (Falke type), 87 tons displacement, and 1320 I.HP. No. 80.

1 of about 150 feet in length (late Swift), 137 tons displacement, and about 1300 I.HP. No. 81.

6 of about 130 feet in length, with a speed of 22½ knots. Nos. 82–87.

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86

These carry an armament of 3-pdr. quick-firing and machine guns, and three torpedo-launching tubes.

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Second Class.

Smaller Vessels, &c.

51 of 60 to 66 feet in length, 12 tons displacement, and of 100 to 140 I.HP.

10 about the same length and of improved type, with a speed of 16 knots.

61

TORPEDO BOATS (WOOD).

12 of 56 feet in length, 11 tons displacement, and 150 I.HP.

The following vessels of various classes are noted in the official *Navy List* for January, 1890, as being non-effective for sea service, and mainly for sale:—

	Displacement.	I.HP.	
Actæon (late Vernon)	830 ...	... Sailing	
Algiers (late Anson)	5260 ...	... 3583	
Calcutta	3590 ...	... Sailing	
Defence (Armourclad)	6270 ...	... 2540	
Irresistible	...	... Sailing	(to be sold)
Kent (late Impregnable) ...	3880 ...	... Sailing	(to be sold)
Merlin (Screw Gunboat) ...	430 ...	... 430	(to be sold)
Newcastle (Screw Frigate; lent to War Department)	4020 ...	... 2354	
Orwell (Gunboat)	330 ...	... 228	(to be sold)
Tyrian (Screw Gunboat) ...	330 ...	... 157	(to be sold)
Valorous (Paddle Frigate) ...	2300 ...	... 1145	(to be sold)
Victoria (3 decker)	6959 ...	... 4191	

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Indian Marine.

(The ironclad ships Abyssinia and Magdala, belonging to the Indian Government, are included in the alphabetical list of Armoured Ships of the Royal Navy.)

Class of Ship.	Name.	Material of Construction.	Propellers.	Where Built.	When Launched	Length.	Breadth.	Draught of Water.	Displacement.	Indicated Horse-Power.	Speed.	Coal Storage.	Armament.
						ft. in.	ft. in.	ft. in.				tons.	
Troop Ship .	Amberwitch	Iron .	1	Liverpool	1862	175 6	27 0	12 0	1,010	250	7·7	90	
Ditto . . .	Canning, was Golconda	Steel .	1	Glasgow	1882	285 0	36 2	16 8	3,300	1,080	10·6	400	
Ditto . . .	Clive . .	Iron and Steel	1	Birkenhead	1882	300 0	45 6	16 6	3,570	2,300	12·0	500	
Inland Steamer	Comet . .	Steel .	Pad.	..	..	..	..	..	144	190	..	..	Two 1-inch Nordenfelts.
Sailing Ship .	Czarewitch	Composite	..	Sunderland	1866	185 0	32 0	19 6	1,990				
Troop Ship .	Dalhousie .	Steel .	1	Greenock	B'lding.	239 6	36 0	15 7	1,960	1,500	13·0	300	Six 6-pr. Q.F. guns.
Surveying Ship	Investigator	Wood .	Pad.	Bombay	1881	180 0	25 8	11 3	856	660	10·5	105	
Inland Steamer	Irrawaddy	Iron .	Pad.	..	..	..	..	..	..	750	..	..	Two 20-prs. B.L.R.; two 9-prs. R.M.L.
Despatch Vessel	Lawrence .	Steel .	Pad.	Birkenhead	1886	212 2	32 2	18 3	1,154	1,200	13·5	270	Four 4-inch B.L.R.
Tug . . .	Madras .	Wood .	Pad.	Blackwall	1876	123 3	20 7	7 5	197	150 nom.	8·0	100	
Tug . . .	Manora .	Wood .	Pad.	Bombay	1869	141 5	26 0	12 1	420 B.M.	250	9·0	125	
Yacht . . .	May Frere	Wood .	Pad.	Bombay	1864	168 0	19 7	8 3	450	500	10·0	60	
1st class Torpedo Gunboat	Plassey	Steel .	2	The Tyne	1890	230 0	27 0	8 3	735	4,500	21·0	100	2 4·7-in. Q.F., 4 3-pr. do.
Guard Ship .	Quangtung	Iron .	Pad.	Birkenhead	1863	185 3	24 7	11 3	900	520	..	160	Six 9-prs. R.M.L.
Inland Steamer	Sir Wm. Peel	Iron .	Pad.	..	..	..	..	..	302	600	..	..	Two 12-pr. Howitzers; four Nordenfelts M.G.
Inland Steamer	Sladen .	Steel .	Pad.	..	..	..	..	..	260	360	..	..	Two 12-pr. Howitzers; four Nordenfelts M.G.
Troop Ship .	Tenasserim	Iron .	1	London	1872	250 0	35 0	18 1	2,570	1,140	11·0	385	
Tug . . .	Undaunted	Iron .	Pad.	Dumbarton	1865	160 0	25 2	11 7	470	1,080	10·0	115	
1st class Torpedo Gunboat	New . .	Steel .	2	The Tyne	B'lding	230 0	27 0	8 3	735	4,500	21.0	100	2 4·7-in. Q.F., 4 3-pr. do.

India also possesses seven First Class Torpedo Boats of the newest type. They were built in England, and sent out in 1889.

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Colonial Marine (Great Britain).

(The Ironclad Turret-ship Cerberus, belonging to the Victorian Government, the five special second class Cruisers, and the two Torpedo Gunboats of the Sharpshooter class for Australia are included in the alphabetical list of Ships of the Royal Navy.)

To what Government belonging.	Class of Ship.	Name.	Material of Construction.	Propellers.	Where Built.	When Launched.	Length.	Breadth.	Draught of Water.	Displacement.	Indicated Horse-Power.	Speed.	Coal Storage.	Armament.
							ft. in.	ft. in.	ft. in.				tons.	
VICTORIA	Old line-of-battle ship	Nelson .	Wood	1	Portsmouth	Converted 1860	216 3	54 6	..	4,096	2,102	10·0	..	Two 7-in. M.L.R.; 18 64-prs. M.L.R.; 12 32-prs.
	Gunboat	Albert .	Steel	2	..	188	115 0	25 0	10 0	350	400	10·0	..	One 8-in. 12-ton B.L.R.; one 6-in. 4-ton do.; two 9-prs. do.; two Nordenfelts.
	Gunboat	Victoria .	Steel	2	..	1883	140 0	27 0	11 0	530	800	12·0	..	One 10-in. 25-ton B.L.R.; two 13-pr. B.L.R.; two 1-in. Nordenfelts.
	Gunboat	Batman .	Iron	..	..	..	..	..	..	387	350	..	..	One 6-in. 4-ton B.L.R.; two Nordenfelts.
	Gunboat	Fawkner .	Iron	..	..	..	..	..	..	387	350	..	..	One 6-in. 4-ton B.L.R.; two Gatlings.
	Gunboat	Gannet .	Iron	..	..	..	..	..	..	346	500	..	..	One 6-in. 4-ton B.L.R.; two Nordenfelts.
	Gunboat	Lady Loch	..	..	..	..	..	..	..	..	..	..	..	One 6-in. 4-ton B.L.R.; two Nordenfelts.
	First class torpedo boat	Childers .	Steel	1	Chiswick	1883	113 0	12 6	5 6	63	750	20·0	10	Two 1½-in. Hotchkiss guns.
QUEENSLAND	Gun-vessel	Gayundah	Steel	2	Glasgow	1884	115 0	25 0	10 0	360	400	10·0	..	One 8-in. 11½-ton B.L.R.; one 6-in. 4-ton do.; one 3-pr. Q.F.G.; two Nordenfelts.
	Gun-vessel	Paluma .	Steel	2	Glasgow	1884	115 0	25 0	10 0	360	400	10·0	..	One 8-in. 11½-ton B.L.R.; one 6-in. 4-ton do.; one 3-pr. Q.F.G.; two Nordenfelts.
	Gunboat	Otter . .	Steel	2	..	..	..	..	..	220	460	..	..	One 64-pr. M.L.R.
	Gunboat	Bonito .	Iron	2	..	..	..	..	..	450	400			
	Gunboat	Stingaree .	Iron	2	..	..	..	..	..	450	400			
	Yacht	Lucinda .	..	Pad.	..	..	..	..	..	..	..			
SOUTH AUSTRALIA	Cruiser	Protector .	Steel	2	..	1884	188 0	30 0	12 6	920	1,640	14·0	..	One 8-in. 11½-ton B.L.R.; five 6-in. 4-ton do.; five Gatlings.

Note.—The Victorian Government also possesses two Second Class Steel Torpedo Boats and three Torpedo Launches; and the Queensland Government possesses one Second Class Steel Torpedo Boat.

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II.

FOREIGN ARMOURED AND UNARMOURED SHIPS.

THE principal dimensions and other details of the ships in the following lists have been in many cases extracted from the Austrian *Marine-Almanach*. With few exceptions all details concerning the ships of any nation have been printed either in the English naval periodicals or in the English newspapers, or in those of foreign countries. Where the latter sources of information failed, the deficiency has been made up from the *Navy Estimates* submitted to the several national Parliaments, and from other public official documents. It would have been impossible in every case to note the source from which each detail was derived without overburdening the pages with references and adding enormously to the size of the book.

The alphabetical arrangement of the ships in each of the two great divisions, armoured and unarmoured, has been followed so as to facilitate reference. There being now no uniform system of classifying the ships of all nations, an attempt has been made to assimilate as far as possible the classification of foreign fleets to that adopted in the British *Navy List*. Occasionally this has been only approximately practicable. It will be observed that the distinction between the smaller gun-*vessels* and the sea-going gun-*boats* is not always apparent, and the former term, applied by some nations to craft to which we apply the latter, has, for special reasons, been preserved.

The vessels commonly known as Torpedo Catchers are named in these lists Torpedo Gunboats. In the British Official Navy Lists they are called First Class Gunboats.

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The sketches of the ships are all drawn on the same scale (except in a few cases specially named), so that their relative sizes are apparent by inspection.

The designation of foreign guns as a general rule by *centimetres* of calibre will permit easy reference to the Tables of Ordnance of the several Powers. In general, it may be stated that, as every nation is engaged in either replacing its naval ordnance with new and improved pieces, or in rearranging the armament of individual ships, it has been only possible to republish the latest accessible information on the subject. The machine gun and torpedo armaments of every fleet vary continually.

ABBREVIATIONS.

A list of Abbreviations of the several classes of ships and vessels is placed at the head of each Table. The following refer to armaments throughout:—

B.L.R.	Breech-loading rifled gun.
M.L.R.	Muzzle „ „ „
l.	Light gun.
M.	Machine gun.
Q.F.	Quick-firing gun.
f. tu. l. car	Fixed torpedo tube or launching carriage for White-head Torpedoes.
P.	Deck protected throughout.
pp.	Deck protected amidships.

The protective decks in all cases are at least one inch thick.

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ARGENTINE REPUBLIC.—Armoured Ships.

c.b., central-battery ship; *c.s.t.*, coast-service turret ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Endurance.	
					Belt.	Battery.					Guns.	Fish Torpedo Dischargers				Coals that can be carried in Bunkers.	At ten knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Almirante Brown** (steel)	4200	240 0	50 0	9 (comp.)	8 (comp.)	11 & 8	20 6	2	4500	8 8-in. 11½-ton B.L.R., 6 4½-in. do. (Armstrong) 4 M.	..	1880	..	13·75	650	4300
c.s.t.	**Andes**	1535	186 0	44 0	6	8 (turret)	11⅞	9 6	2	750	2 12½-ton Armstrong M.L.R., in turret, 2 lt. and 4 M.	..	1875	..	9·05	120	2880
„	**Plata**	1535	186 0	44 0	6	8 „	11⅞	9 6	2	750	2 12½-ton Armstrong R.L.R., in turret, 2 l.	..	1874	..	9·05	120	2880

It is understood that a large barbette ironclad of above 7000 tons displacement is to be constructed in England shortly, and two small ironclads of shallow draught for river service are being built by Messrs. Laird at Birkenhead.

ARGENTINE REPUBLIC.—Unarmoured Ships.

cr., cruiser; *g.v.*, gun-vessel; *tor.g.b.*, torpedo gunboat.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Endurance.	
									Guns.	Fish Torpedo Dischargers.				Coals that can be carried in Bunkers.	At ten knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Argentina** .	820	192 0	27 0	Steel	13 0	1	850	1 6-in. B.L.R., 6 7-cm. Krupp, 4 M. . .	..	..	..	16·0	220	.. ..
tor.g.b.	**Espora** . .	520	210 0	25 0	Steel	8 0	2	3250	2 14-pdr. Q.F., 1 8-pdr. do., 2 3-pdr. do., 2 M.	5 l. car.	1890	..	20·0	100	2500
cr.	**Patagonia** .	1530	220 0	32 10	Steel & wood	12 9	2	2400	1 10-in. B.L.R., 3 6-in. do., 6 l., 10 M. .	..	1885 at Trieste.	..	14·0	350	..
g.v.	**Parana** . .	550	142 8	25 0	Iron	11 9	1	475	2 6½-ton M.L.R., 2 lt.	..	1874	..	11·0	..	..
tor.g.b.	**Rosales** . .	520	210 0	25 0	Steel	8 0	2	3250	2 14-pdr. Q.F., 1 8-pdr. do., 2 3-pdr. do., 2 M.	5 l. car.	1890	..	20·0	100	2500
cr.	**25 de Mayo** P.	3200	325 0	43 0	Steel	16 0	2	13,800	2 21-cm. B.L.R., 8 12-cm. Q.F., 12 3-pdr. do., and 12 1-pdr. do.	3 l. car.	1890	..	22·43	600	..
g.v.	**Uruguay** .	550	142 8	25 0	Iron	11 9	1	475	2 6½-ton M.L.R., 2 lt.	..	1874	..	11·0	..	..

4 *Gunboats* (*Rendel type*), 416 tons, 420 I.HP.; 2 *1st class Torpedo boats of the Coureur type* improved by Thornycroft; 6 *1st class Torpedo boats of the latest Yarrow type*; 4 *1st class Torpedo boats* (100 ft. long, of 600 I.HP. and 20 knots speed); 8 *2nd class Torpedo boats of the most recent Yarrow type*; 4 *Spar Torpedo boats*; 1 *paddle Torpedo School vessel*, Maipu; 7 *screw steam vessels*; 6 *paddle-wheel vessels*, besides steam transports, and a sailing Corvette of 650 tons.

A large protected cruiser of over 5000 tons displacement is, it is understood, to be built in England shortly.

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AUSTRIA.—Armoured Ships.

b., barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast service ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Endurance.	
					Belt.	Battery or Turret.					Guns.	Fish Torpedo Dischargers				Coals that can be carried in Bunkers.	At 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Archduke Albert** (iron)	5940	285 2	56 3	9	7	9½	22 0	1	4060	8 24-c.m. B.L.R. 15½-ton Krupp, 6 9 c.m. Uchatius, 11 M., 2 l.	..	1872	357,600	13·00	453	1472
b.	**Archduke Ferdinand Max** (Gunnery ship) (wood)	5060	262 0	52 6	5	5	..	23 6	1	3500	14 18-c.m. Krupp, B.L., 4 9-c.m. Uchatius, 5 M., 2 l.	..	1865	..	12·50	330	..
b.	**Crown Prince Rudolph** (steel)	6900	295 0	62 4	12	11	..	25 3	2	6500	3 30½-c.m. 48-ton Kr., 6 12 c.m. 11 M., 2 l.	..	1887	330,000	14·00	600	..
c.b.	**Custoza** . (iron)	7060	302 3	58 0	9	7	8¼	24 6	1	4820	8 26-c.m. 22-ton Krupp, 6 9 c.m. Uchatius, 11 M., 2 l.	..	1872	414,400	14·00	584	1624
c.b.	**Don Juan de Austria** (iron)	3550	240 3	50 0	8	6	9¾	20 0	1	2920	8 21-c.m. 10-ton Krupp, 6 9 c.m. Uchatius, 11 M., 2 l.	..	1875	..	13·50	380	2000
br.	**Habsburg** (wood)	5140	262 0	52 0	5	5	27⅞	23 9	1	3500	14 7-in. 6½-ton M.L.R. Armstrong, 4 9-c.m. Uchatius, 9 M., 2 l.	..	1865	280,672	12·00	330	..
c.b.	**Kaiser** . (wood)	5810	254 0	58 3	6	5½	31	24 3	1	3200	10 9-in. 12-ton Armstrong M.L.R., 6 9-c.m. Uch., 11 M., 2 l.	..	1871	337,200	13·00	450	1519
		..	..	..	..	..	..	20 0	2	9800	2 24-c.m. B.L.R. Krupp, 6 15-c.m. do., 11 Q.F., 2 l.	..	1889	..	19·0	..	..
c.b.	**Kaiser Max** (iron)	3550	240 3	50 0	8	6	9¾	20 0	1	2890	8 21-c.m. 10-ton Krupp, 4 9 c.m. Uchatius, 11 M., 2 l.	..	1875	211,600	13·00	380	2000
c.b.	**Lissa** . (wood)	6080	288 3	56 9	6	5½	30	26 0	1	4200	12 24-c.m. 15½-ton Krupp, 4 9 c.m. Uchatius, 11 M., 2 l.	..	1869	412,800	13·00	490	1420
c.b.	**Prince Eugen** (iron)	3550	240 6	50 0	8	6	9¾	20 0	1	2960	8 21-c.m. 10-ton Krupp, 4 9 c.m. Uchatius, 11 M., 2 l.	..	1877	..	13·00	380	2000
b.	**Princess Imperial Stefanie** (was Archduke Ferdinand Max) (steel)	5150	278 10	55 9	9	8	..	21 6	2	6500	2 30½-c.m. 48-ton Krupp, 6 15 c.m. 5-ton Krupp, 11 M., 2 l.	..	1887	300,000	17·00	400	..
c.b.	**Tegetthoff** (iron & steel)	7390	286 11	71 1	14	14	9¾	24 10	1	6500	6 28-c.m. 27-ton Krupp, 6 9 c.m. Uchatius, 11 M., 2 l.	..	1878	?247,378	14·00	670	3300
River Monitor	**Leitha** (iron & steel)	310	166 0	27 6	1¾	2½ (turret)	7½	3 7	2	320	2 15-c.m. Wahrendorf, 1 M.	..	1871	20,000	8·00	20	..
„	**Maros** (iron & steel)	310	166 0	27 6	1¾	2½ (turret)	7½	3 7	2	320	2 15-c.m. Wahrendorf, 1 M.	..	1871	20,000	8·00	20	..

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AUSTRIA.—Unarmoured Ships.

corv., corvette; *fr. cr.*, frigate-built cruiser; *g. v.*, gun-vessel; *to. g. b.*, torpedo gunboat; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g. v.	Albatross	570	150 11	26 3	wood	11 2	1	580	2 15-c.m. 3-ton Wahrendorf, 1 l.	..	1873	..	10·00	60	..
fr. cr.	Archduke Frederic	1570	173 10	39 5	wood	16 9	1	780	14 15-c.m. 3-ton Wahrendorf, 1 l.	..	1874	..	9·00	200	..
corv.	Aurora	1340	190 6	32 10	composite	16 1	1	1170	4 15-c.m. 3-ton Wahrendorf, 1 l.	..	1873	..	11·00	160	..
to. g. b.	Blitz	350	193 6	22 4	steel	8 0	..	2600	9 Q.F.	..	1888	..	22·0	..	..
fr. cr.	Donau	2510	233 4	42 8	wood	19 8	1	1430	11 15-c.m. 5-ton Krupp, 1 l.	..	1874	..	12·00	320	..
corv.	Fasana	1970	223 3	39 5	wood	16 9	1	1750	4 15-c.m. 5-ton Krupp, 3 l.	..	1870	..	12·00	315	..
cr.	Frundsberg	1340	190 6	32 10	composite	16 1	1	1260	4 15-c.m. 3-ton Wahrendorf, 1 l.	..	1873	..	11·00	160	..
corv.	Heligoland	1820	226 6	36 2	wood	16 9	1	1860	5 15-c.m. 7-ton Krupp, 1 l.	..	1867	..	12·00	250	..
g. v.	Hum	900	173 10	29 6	wood	12 6	1	920	4 15-c.m. 3-ton Wahrendorf 1 l.	..	1861	..	13·00	150	..
cr. P.	Kaiserin Elizabeth	4060	321 6	47 6	steel	18 7	2	9800	2 24-c.m. 27-ton B.L.R. Krupp, 6 15-c.m. 6-ton do., 11 Q.F., 2 l.	5 f. tu. or l.car	1890	..	19·0	660	4500
„ „	Kaiser Franz Joseph	4060	321 6	47 6	steel	18 7	2	..	2 24-c.m. 27-ton B.L.R. Krupp, 6 15-cm. 6-ton do., 11 Q.F., 2 l.	5 f. tu. or l.car	1889	..	19·0	660	4500
g. v.	Kerka	540	146 8	26 3	wood	11 2	1	300	2 15-c.m. 3-ton Wahrendorf, 1 l.	..	1860	..	9·00	50	..
to. g. b.	Komet	350	193 6	22 4	steel	8 0	..	2600	9 Q.F.	..	1888	..	22·0	..	..
fr. cr.	Laudon	3430	253 0	46 0	composite	20 8	1	2850	15 15-c.m. 5-ton Krupp, 7 M., 2 l.	..	1873	..	13·00	450	..
Torpedo cruiser	Leopard	1550	224 0	34 0	steel	14 0	2	6200	2 12-c.m. 2¼-ton Krupp, 10 Q.F. & M.	4 tu. or l.car	1886	200,000	18·30	250	..
Torpedo vessel	Lussin	913	200 4	26 3	steel	12 2	2	2600	2 15-c.m. 5-ton Krupp, 7 M., 1 l.	..	1883	..	14·00	200	..
cr. P.	1 unnamed (building at Pola)	4060	321 6	47 6	steel	18 7	2	..	2 24-cm. 27-ton B.L.R. Krupp, 6 15-cm. 6-ton do., 11 Q.F., 2 l.	5 f. tu. or l.car	Bldg.	..	19·0	660	4500

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AUSTRIA.—Unarmoured Ships—*continued.*

corv., corvette; *fr. cr.*, frigate-built cruiser; *g. v.*, gun-vessel; *to. g. b.*, torpedo gunboat; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
to. g. b.	**Meteor**	350	187 0	22 4	steel	16 9	2	2600	2 12-c.m. 2¼-ton B.L.R. Krupp, 10 Q.F. & M.	f. tu. or l.car	1887	..	22·0	120	..
g. v.	**Narenta**	540	147 8	26 3	wood	11 2	1	310	2 15-c.m. 3-ton Wahrendorf, 1 l.	..	1860	..	9·00	50	..
„	**Nautilus**	570	150 11	26 3	wood	11 2	1	410	2 15-c.m. 3-ton Wahrendorf, 1 l.	..	1873	..	9·00	60	..
Torpedo cruiser	**Panther**	1550	224 0	34 0	steel	14 0	2	6200	2 12-c.m. (35 cal.) 2¼-ton Krupp, 10 Q.F. & M.	4 f. tu. or l.car	1885	..	18·50	250	..
to. g. b.	**Planet**	480	210 0	23 0	steel	8 3	2	2500	10 Q.F.	1 l. car.	1889	..	21·0	..	..
fr. cr.	**Radetzky**	3430	253 0	46 0	composite	20 8	1	3400	15 15-c.m. 5-ton Krupp, 7 M., 2 l.	..	1872	..	14·00	450	..
„	**Saida**	2440	233 4	42 8	wood	19 1	1	2010	11 15-c.m. 5-ton Uchatius, 1 l.	..	1878	..	12·00	320	..
g. v.	**Sansego**	350	111 7	23 0	wood	9 0	1	290	2 15-c.m. 3-ton Wahrendorf	..	1861	..	9·00	45	..
Torpedo vessel.	**Sebenico**	880	187 0	26 3	steel	12 2	2	2600	4 9-c.m. Uchatius, 2 M., 1 l.	..	1882	..	14·00	200	..
„	**Seehund**	1550	224 0	34 0	steel	14 0	2	6200	2 12-c.m. 2¼-ton Krupp, 10 Q.F. & M.	4 tu. or l.car	1886	..	18·50	250	..
„	**Spalato**	840	179 6	26 3	steel	12 2	2	2600	4 9-c.m. Uchatius, 7 M., 1 l.	..	1879	..	14·00	150	..
Torpedo cruiser	**Tiger**	1675	233 0	32 10	steel	15 5	2	5600	4 12-c.m., 2¼-ton B.L.R., 10 M.	..	1887	..	18·0	300	..
to. g. b.	**Trabant**	480	210 0	23 0	steel	8 3	2	3500	10 Q.F.	1 l. car.	Bldg.	..	21·0	..	..
Torpedo vessel	**Zara** (School ship)	840	179 6	26 3	steel	12 2	2	2600	4 9-c.m. Uchatius, 7 M., 1 l.	..	1879	..	14·00	150	..
corv.	**Zrinyi**	1340	190 6	32 10	composite	16 1	1	1170	4 15-c.m. 3-ton Wahrendorf, 1 l.	..	1871	..	11·00	160	..

Paddle-wheel vessels, Andreas-Hofer, Taurus, Trieste; two new gunboats, the Gemse and Grille, of 320 tons displacement and 360 indicated horse-power; also Yachts, Harbour Service and Training Ships, Transports, &c.

Torpedo boats. Of the First Class, *twenty-three* in number of the Falke and Habicht types, of 83 to 88 tons displacement, 800 to 900 I.HP., and *five* of 83 tons displacement, and 1000 I.HP. Each of them is armed with two machine guns; *twenty-six* of from 56 to 64 tons displacement, and 450 to 700 horse-power, 18 to 20 knots; and *eight* of 27 tons displacement, 200 to 300 horse-power, and 15 to 18 knots.

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BELGIUM.

Though Belgium has no Navy properly so called, there are about a dozen steam vessels, principally employed as packets, which are under the orders of the Government, and of which several would be found useful under certain conditions of naval warfare. Seven of these steamers are of 578 tons.

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BRAZIL.—Armoured Ships.

c.b., central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery on Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
River Monitor.	**Alagôas** . . (wood)	340	120 0	28 0	4½	4½ on turret	14½	4 10	2	180	1 70-pdr. Whitworth M.L.R.	..	1886	..	7·00		..
t.	**Aquidaban** (steel copper-sheathed)	4950	280 0	52 0	11 comp.	11½ comp., 10 comp. on turret	10	18 0	2	6200	4 9-in. 20-ton B.L.R. (Armstrong) 4 70-pdr. 5-ton do., 15 M.	5 f. tu. or l. car.	1885	345,000*	15·00	600	..
c.s., *t.*	**Bahia** . . (iron)	1000	178 0	35 0	4½	5½ on turret	10⅝	8 6	2	1640	2 7-in. M.L.R. (Whitworth), 2 M.	..	1865	..	10·00	..	..
c.s., *c.b.*	**Brazil** . . (iron)	1518	179 8	35 0	4½	4½ on turret	8	12 5	1	1500	4 7-in. M.L.R. (Whitworth), 4 68-pdr., 4 l., s b.	..	1864	60,000	11·30	..	..
t.	**Javary** . . (iron)	3700	240 0	58 0	12	13 on turret	9¾	11 5	2	2500	4 10-in. Whitworth M.L.R., 6 5-in. B.L.R., 5 M.	..	1875	..	11·20	200	680
c. s., *t.*	**Lima-Barros** . (iron)	1350	180 0	36 0	4½	4½ on turret	8¼	13 5	2	2100	4 7-in. Whitworth M.L.R. .	..	1866	..	12·00	200	..
cs., *c.b.*	**Mariz-e-Barros** (iron)	1444	198 10	36 0	4½	4½ on turret	8	10 10	2	600	4 7-in. Whitworth M.L.R. .	..	1866	..	9·00	..	..
River Monitor	**Piauhy** . . (wood)	340	120 0	28 0	4½	4½ on turret	14½	4 10	2	180	1 70-pdr. Whitworth M.L.R. .	..	1887	..	7·00	..	..
t.	**Riachuelo** (steel copper-sheathed)	5700	305 0	52 0	11 comp.	11 comp., 10 comp. on turret	10	19 6	2	7300	4 9-in. 20-ton B.L.R. (Whitworth, altered by Armstrong), 6 5½-inch 5-ton do., 15 M.	5 f. tu. or l. car.	1883	365,000*	16·71	800	4,500 (at 15 knots)
River Monitor	**Rio Grande** . (wood)	340	120 0	28 0	4½	4½ on turret	14½	4 10	2	180	1 70-pdr. Whitworth M.L.R. .	..	1888	..	7·00	..	..
c.b.	**Sete de Setembro** (wood)	2145	219 10	46 6	4½	4½	..	12 6	2	2000	4 9-in. 18-ton Whitworth M.L.R., 5 M.	..	1874	..	12·00	..	..
t.	**Solimões** . . (iron)	3700	240 0	58 0	12	13 on turret	9¾	11 5	2	2200	4 10-in. 25-ton Whitworth M.L.R., 5 M.	..	1875	..	11·20	200	680

* Exclusive of guns and ammunition.

NOTE.—The Brazil and Lima-Barros are now used as Stationary Floating Batteries.

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BRAZIL.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *g.v.*, gun-vessel; f. tu., l. car., fixed tube or launching carriage for discharging **Fish torpedoes.**

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr.	**Almirante Barroso** .	1960	213 5	36 2	composite	17 5	1	2200	7 5½-in. Whitworth B.L.R., 6 M. . .	..	1882	..	12·00	..	..
,,	**Almirante Tamanderi** .	4023	270 0	46 0	steel (wood sheathed.)	18 4	2	7500	4 8-in. 12-ton B.L.R. (Armstrong), 12 6-in. 5-ton do., 16 M.	..	1890	..	17·00	750	..
,,	**Guanabàra** . . .	1900	200 0	41 2	wood	16 4	1	3000	9 70-pdr. Whitworth 6 M. 2 l. . .	..	1877	..	13·00	..	..
,,	**Imperial Marinheiro** . (used as a training vessel.)	726	167 0	26 3	composite	11 0	1	750	6 12-c.m. B.L.R., 1 9-c.m. do., 4 M. .	..	1883	..	9·00	..	..
corv.	**Nictheroy** . . .	1800	192 0	41 0	wood	16 0	1	1000	12 70-pdr. Whitworth 6 M. . . .	..	1862	..	8·00	..	..
,,	**Parnahyba** (Torpedo School ship)	838	170 6	26 3	composite	11 2	1	900	1 70-pdr. Whitworth 4M., 6 lt. . .	..	1878	..	10·00	..	..
cr.	**Primeiro de Março** .	726	167 3	26 3	composite	10 6	1	750	7 4½-in. Whitworth B.L.R., 4 M. . .	..	1881	..	9·00	..	..
,,	**Trajano**	1400	210 2	29 6	composite	14 9	1	2400	7 4½-in. Whitworth B.L.R., 4 M. . .	..	1873	..	13·00	..	..
,, P.	New ship . . .	4500	..	..	steel	..	..	5500	4 8-in. 12-ton B.L.R., 10 6 in. do., Q.F., 1 M.	..	Bldng.	..	17·0	..	..

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Double-screw gunboats. — Guarany, Iniciadora, Pedro Affonso, Traripe, 250 to 330 tons ; 160 to 260 I.HP.

River-service gunboats. — Cabedello, Camocim, Cananéa, Carioca Marajó of 210 tons ; 200 I.HP.

Paddle river-service gunboats.—Braconnot, Lamego, Manáos, Taquary.

Paddle steamers.—Amazonas, Felippe Camarão, Fernandes Vieira, Henrique Diaz, Tramandahy, Vidal de Negreiros.

Torpedo boats.—Three first-class boats of the Coureur type improved, built by Messrs. Thornycroft, of Chiswick. They are 150 feet long, 14 feet 6 inches broad, and have a displacement of 110 tons. The speed is 25 knots on the measured mile, and 24 knots in a two hours' trial. Five first-class, built in England in 1882, of 110 ft. in length, and 12½ ft. in breadth, indicated horse-power 600, and speed 20 knots, sixteen of smaller size, second class and Spar Torpedo Boats.

Also Training and Harbour Ships and Transports.

BULGARIA.

This principality is already in possession of the nucleus of a naval force in a flotilla of eleven steamers of small size, of which one is used as the Prince's Yacht.

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CHILI.—Armoured Ships.

c.b., central-battery ship; *b.*, barbette ship; *t.*, turret ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	Almirante Cochrane (iron)	3500	210 0	45 9	9	8	$7\frac{3}{4}$	19 8	2	2920	4 9-in. B.L.R. 18-ton Arm., 2 7-in. do., 7 M., 4 l.	..	1874	..	13·00	500	1900
c.b.	Blanco Encalada* (iron)	3500	210 0	45 9	9	8	$7\frac{3}{4}$	19 8	2	3000	6 12-ton Armstrong M.L.R., 7 M., 4 l.	..	1875	..	12·00	500	1900
b.	Capitan Prat (steel sheathed and coppered)	6900	328 0	60 8	12	..	..	21 10	2	12, 000	4 24-c.m. B.L.R., 8 12 c.m. do. . .	..	ldg.	391,000	19·00	400	..
t.	Huascar . . (iron)	1800	200 0	35 0	$4\frac{1}{2}$	$5\frac{1}{2}$ on turret	14	15 6	1	1050	2 10-in. $12\frac{1}{2}$-ton Armstrong M.L.R., 2 40 pdr., 2 l.	..	1865	..	12·00	250	..

* Torpedoed and sunk during the civil war, April, 1891.

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CHILI.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; P., deck protected throughout, *to.gb.*, torpedo gunboat; *g.v.*, gun vessel.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	Abtao (used as a transport.)	1050	227 0	29 6	composite	15 6	1	300 (nom.)	1 70-pr. B., 4 40-pr. B. Armstrong, 4 M.	..	1864	..	9·00	300	..
gb.	Almirante Condell	750	240 0	27 6	steel	9 6	2	4500	2 14-pdr. Q.F., 2 3-pdr. do., 2 M. .	4 l. car	1890	..	21·00	100	2500
to.gb.	Almirante Lynch	750	240 0	27 6	steel	9 6	2	4500	2 14-pdr. Q.F., 2 3-pdr. do., 2 M. .	4 l. car	1890	..	21·00	100	2500
corv.	Chacabuco . .	1100	218 6	33 4	wood	17 4	1	1200	3 8-in., 2 70-pdrs., 4 40-pdr. (all B.L.R. Armstrong)	..	1866	..	10·00	400	..
cr.	Esmeralda P. (one inch thick)	3000	270 0	40 0	steel	18 3	2	6500	2 10-in. 25-ton Armstrong B.L.R., 6 6-in. 4-ton. do., 2 Q.F., 6 M.	3 f. tu. or l.car	1883	..	18·28	600	2200
corv.	Magellanes . .	800	190 0	28 0	composite	14 9	2	1230	1 7-in. B.L.R., 1 64-pdr., 3 l. . .	..	1874	..	11·00	300	..
„	O'Higgins . .	1100	218 6	33 4	wood	17 4	1	1200	3 7-in. B.L.R., 4 40-pdr. B. (all Armstrong)	..	1866	..	10·00	500	..
„	Pilcomayo . .	600	171 0	27 4	wood	..	1	180 (nom.)	2 70-pdr., 2 40-pdr., 2 l. (all Armstrong)	..	1874	..	9·00	200	..
cr.	Presidente Errazuriz P.	2080	268 0	35 9	steel & copper sheathed	19 6	2	5400	4 15-c.m. Q.F., 2 12-c.m. do., 4 57-m.m. do., 6 M.	3 l. car	1890	..	19·0	..	4500 at 12 knots
cr.	Presidente Pinto P.	2080	268 0	35 9	steel & copper sheathed	19 6	2	5400	4 15-c.m. Q.F., 2 12-c.m. do., 4 57-m.m. do., 6 M.	3 l. car	1890	..	19·0	..	4500 at 12 knots

Besides Sailing ships, there are—

Gunboats.—Five of 420 tons displacement and 7 to 10 knots speed.

Torpedo boats.—Eleven 1st class boats, mainly of 90 tons displacement, 100 feet in length, and a speed of 22 knots; 2 2nd class boats of 40 tons displacement, 50 feet long, and speed of 18 knots.

Despatch Vessel.—Amazonas.

Besides transports and small steamers.

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CHINA.—Armoured Ships.

(The Chinese Navy is divided into Provincial Fleets: Canton, Foo-chow, Shang-hai, Peiho, and North Coast.)
a.g.b., armoured gunboat; *b.*, barbette ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.	**Chen-Yuen** . (steel)	7430	308 5	59 0	14 comp.	12 comp.	14	20 0	2	6200	4 30½-c.m. 37-ton Krupp, 2 15-c.m. 4-ton do., 8 M., 2 l.	2 l. car.	1882	..	14·50	1000	..
b.	**King-Yuen** . (steel)	2850	270 0	40 0	9½	8 comp.	3-in. steel dk.	16 6	2	3600	2 8¼-in. 10-ton B.L.R., 2 6-in. do., 7 M.	1 f.tu.sb. 3 l. car.	1887	..	16·50	325	..
b.	New vessel . . (steel)	2850	270 0	40 0	9½	8 comp.	..	..	2	3600	.. ..	..	1891	..	16·50	..	..
b.	**Lai-Yuen** . (steel)	2850	270 0	40 0	9½	8 comp.	3-in. steel dk.	16 6	2	3600	2 8¼-in. 10-ton B.L.R., 2 6-in. 4-ton do., 7 M.	1 f.tu.sb. 3 l. car.	1887	..	16·50	325	..
b.	**Ting-Yuen** . (steel)	7430	308 5	59 0	14 comp.	12 comp.	14	20 0	2	6200	4 30½-c.m. 37-ton Krupp, 2 15-c.m. 4-ton do., 8 M., 2 l.	2 l. car.	1881	..	14·50	1000	..
a.g.b.	**Tien-Sing** . (wood)	195	105 0	20 4	1⅛	3	5	7 0	2	340	1 17-c.m. Krupp . . .	..	1875	..	10·0	..	..

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CHINA.—Unarmoured Ships.

cr., cruiser; *fr. cr.*, frigate-built cruiser; *tr. gb*, torpedo gunboat; *g.v.*, gun-vessel; P., deck protected throughout; *pp*, partial deck protected; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr.	**Chih-Yuen** . . P.	2300	250 0	38 0	steel	15 0	2	5500	3 8-in. 12-ton B.L.R., 2 6-in. 4-ton. do.	4 f. tu. or l.car	1886	..	18·00	450	..
,,	**Ching-Yuen** . . P.	2300	250 0	38 0	steel	15 0	2	5500	3 8-in. 12-ton B.L.R., 2 6-in. 4-ton. do.	4 f. tu. or l.car	1886	..	18·00	450	..
,,	**Foo Chow** . . .	1300	223 0	32 0	steel	13 3	2	1600	2 6-in. B.L.R., 4 l.	..	1887	..	13·00	..	..
fr. cr.	**Hai-An** . . .	2630	300 0	42 0	wood	21 0	1	1750	2 21-c.m. Krupp, 20 12-c.m. do., 1 17-c.m. do.	..	1872	..	12·00	..	..
cr.	**Huan-Tai** . . .	1300	223 0	32 10	steel	13 3	2	1600	2 15-c.m. B.L.R. Krupp, 5 12-c.m. do., 4 M.	2 f. tu. or l.car	1888	..	15·0	..	..
,,	**Kai-Chih** . . .	2480	259 0	39 4	steel	15 2	..	3000	1 25-c.m. B.L.R., 1 17-c.m. do., 6 15-c.m. do., 6 M.	..	1884	..	15·00	..	..
g.v.	**Mei-Yun** . . .	578	170 0	22 9	composite	9 2	1	400	1 16-c.m. Vavasseur, 2 12-c.m. Vavasseur	..	1869	..	8·00	..	..
cr.	**Nan-Schuin** . . .	2200	253 0	36 2	steel	18 1	1	2400	2 8-in. 10-ton Armstrong B.L.R., 8 4½-in. do.	..	1884	..	15·00	..	..
,,	Two new vessels . .	2200	253 0	36 2	steel	18 1	2	2400	,, ,,	..	Bldg.	..	15·00	..	..

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cr.	**Nan-Thin** . . .		2200	253	0	36	2	steel	18	1	1	2400	2 8-in. 10-ton Armstrong B.L.R., 8 4½-in. do.	..	1883	..	15·00	..	..
„ *pp.*	**Tshao-Yong** . .		1350	210	0	32	0	steel	15	8	2	2677	2 10-in. 25-ton Armstrong B.L.R., 4 4½-in. do., 10 M., 2 l.	..	1881	..	16·80	300	5380 (at 8 knots)
g.v.	**Tshen-Hai** . . .		578	160	10	26	3	wood	10	6	1	480	1 6½-ton Armstrong M.L.R., 6 l. . .	..	1872	..	10·00	..	..
cr.	**Tshi-Yuen** . .	P.	2355	236	3	34	5	steel	15	9	2	2800	2 21-c.m. (35 calibre) Krupp, 1 15-c.m. do., 4 l., 6 M.	4 tu.	1886	..	15·00	230	..
„	**Tsi-Yuen** . .	P.	2355	236	3	33	0	steel	15	9	2	2800	2 21-c.m. (35 calibre) Krupp, 1 15-c.m. do., 4 l., 6 M.	4 tu.	1886	..	15·0	230	..
g.v.	**Tsing-Yuen** . . .		578	160	10	26	3	wood	10	6	1	480	1 6½-ton Armstrong M.L.R., 6 l. . .	..	1872	..	10·00	..	..
cr.	**Yang-Tao** . . .		2500	253	0	36	2	composite	18	0	2	2400	3 8-in. 10-ton B.L.R., 7 4¾-in. do.	..	1883	..	15·00	..	..
„ *pp.*	**Yang-Wai** . . .		1350	210	0	32	0	steel	15	8	2	2580	2 10-in. 25-ton Armstrong B.L.R., 4 4½-in. do., 10 M., 2 l.	..	1881	..	16·00	300	5370 (at 8 knots)
tr. gb.	Not named . . .		450	200	0	23	0	steel	8	3	2	2700	1 4-in. B.L.R., 4 M.	4 l. car.	Bldg.	..	19·0	100	..
„	**Ye-Sing** . .		2500	253	0	36	0	composite	18	0	1	2400	3 8-in. 10-ton B.L.R., 7 4¾-in. do.	..	1888	..	15·00	..	..
tr. cr.	Three vessels building .		3400	..		..		steel	..		2	..	.. ..	..	Bldg.	..	..	..	..

Gunboats (*Rendel's System*).—Eleven of 325 to 440 tons displacement; 235 to 450 indicated horse-power, named with letters of Greek alphabet.

Gunboats (*Canton Flotilla*).—Thirteen of 100 to 350 tons displacement.

Floating Batteries.—Six with 3 12-ton Armstrong guns in a wooden fixed turret for river service.

Torpedo boats.—Twenty-two First-class, of which one is 160 ft long, 19½ ft. broad, of 1500 horse-power, and 23 knots speed, and nine Second-class boats.

Also paddle-wheel vessels, transports, &c.

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DENMARK.—Armoured Ships.

b.c., belted cruiser; *br.*, broadside ship; *c.s.*, coast-service vessel; *t.*, turret ship; f.tu., fixed tubes, and l. car., launching carriages for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Battery or Turret.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.c.	Absalon . . (iron)	527	150 0	26 0	2½	2½	6	10 2	1	500	6 7½-c.m. B.L.R. Krupp, 2 M. .	..	1862	..	10·00	65	..
br.	Denmark . . (iron)	4747	270 0	49 6	4½	4½	18	19 10	1	1007	12 8-in. 9 ton Armstrong M.L.R., 12 6-in. Finspong M.L.	..	1864	260,000	8·00	625	..
Torpedo School Ship	Esbern Snare . (iron)	527	150 0	26 0	2½	2½	6	10 2	1	500	2 M.	1 f. tu. or l.car	1862	..	10·00	65	..
c.s., t.	Gorm . . . (iron)	2344	231 0	40 0	7	8 turret	10	14 0	2	1670	2 10-in. 18-ton Armstrong M.L.R., 3 8 7-c.m. Krupp, 4 M.	..	1870	104,000	12·25	115	..
t.	Helgoland . . (iron)	5347	257 6	59 2	12	10	10	18 8	2	4000	1 30½-c.m. 36-ton Krupp, 4 26-c.m. 22-ton do., 5 12½-c.m. do. 10 M.	4 f. tu. or l.car	1878	275,000	12·00	230	1070
b.	Iver Hvitfeldt (steel)	3260	242 0	49 6	12	8 on barbettes	..	18 0	2	5000	2 26-c.m. 28-ton Krupp, 6 12-c.m. do., 10 M.	4 f. tu. or l.car	1886	200,000	15·60	250	..
c.s., t.	Lindormen . . (iron)	2076	216 0	39 5	5	5 turret	9¾	13 9	2	1560	2 9-in. 13-ton Armstrong M.L.R., 3 8·7-c.m. Krupp 4 M.	..	1868	93,000	12·00	120	..
c.b.	Odin . . . (iron)	3083	237 0	50 0	8	8	10	15 6	1	2260	4 10-in. 18-ton Armstrong M.L.R., 4 8·7-c.m. Krupp B.L.R., 6 M.	..	1872	147,000	12·40	180	560
br.	Peder Shram . (wood) (Harbour Service)	3373	220 0	48 5	5	4½	..	20 7	1	1680	8 8-in. 9-ton Armstrong M.L.R., 8 6-in. Finspong, & 12·26 do.	..	1864	..	11·70	300	1589
t.	Rolf Krake . . (iron)	1344	185 2	38 3	4½	4½	9	10 6	1	750	2 8-in. 9-ton Armstrong, 2 8·7-c.m. Krupp, 4 M.	..	1863	74,000	7·80	135	..
Torpedo Ship	Tordenskiold . (steel)	2400	221 6	43 3	Armour on deck 4 in. to 2 in.	8 (steel)	..	15 6	2	2600	1 30½-c.m. 52-ton Krupp, 4 12-c.m. do., 8 M.	4 f. tu. or l.car	1880	138,900	14·00	170	..
t.	New ship . . (steel)	3290	243 0	49 3	12	11½	8¼ turret	11 6	2	5100	2 26-c.m. 28-ton B.L. Krupp, 4 12-c.m. do., 12 M.	4 f. tu. or l.car	Bldng.	..	15·5	285	..

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DENMARK.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *fr. cr.*, frigate-built cruiser; *g.v.*, gun-vessel; P., deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Torpedoes.					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	Dagmar . . .	1193	173 10	33 10	wood	16 0	1	800	14 5½-in. 4¾-ton Krupp, 4 M. .	..	1861	50,000	9·50	150	..
g.v.	Diana	556	154 6	26 3	wood	10 2	1	500	6 7½-c.m. Krupp, 2 M. . .	..	1863	33,000	9·00	60	..
„	Falster . . .	356	111 0	28 10	iron	7 6	2	510	1 10-in. 20-ton Armstrong M.L.R., 2 7½-c.m. Krupp, 2 M. . .	..	1873	33,000	9·80	20	..
fr. cr.	Fyen . . . P.	2596	226 6	45 6	steel copper sheathed	18 1	1	2700	4 long 15-c.m. 4¾-ton Krupp, 14 15-c.m. 3½-ton short do., 6 M.	2 f. tu. or l.car	1882	170,000	13·00	290	..
g.v.	Fylla	556	154 0	26 3	wood	10 2	1	500	6 7½-c.m. Krupp, 2 M. . . .	..	1862	33,000	9·00	60	..
cr. (3rd class)	Geiser	1280	257 6	27 6	steel	..	..	..	2 15-cm. Krupp, 4 57-cm. Q.F. .	..	Bldng.	..	..	..	..
cr.	Hekla	1280	233 0	32 10	steel	11 2	2	3000	6 long 15-c.m. Krupp, 10 M. .	..	Bldng.	..	17.00	..	..
g.v.	Ingolf	870	192 0	28 0	iron	12 6	1	670	2 15-c.m. Krupp, 47½-c.m. do., 2 M.	..	1876	44,000	10·50	130	..
fr. cr.	Jylland . . .	2457	200 3	44 3	wood	19 5	1	1350	20 6-in. Finspong M.L.R., 6 12-c.m. Krupp, 4 M.	..	1860	84,000	11·00	260	..
g.v.	Moen	356	111 0	28 10	iron	7 6	1	523	1 10-in. 20-ton Armstrong M.L.R., 2 8·7-c.m. Krupp, 2 M.	..	1875	..	9·20	20	..
corv.	Saint Thomas . .	1572	224 0	33 0	wood	17 0	1	1870	1 8-in. 9-ton Armstrong M.L.R., 4 12-c.m. Krupp, 3 M.	..	1871	..	13·00	190	..
cr.	Valkyrien* . P.	2900	268 0	43 6	steel	18 0	2	5000	2 long 21-c.m. 10-ton Krupp, 6 15-c.m. long 4¾-ton Krupp, 10 M.	5 f. tu. or l.car	1887	..	17·00	450	..

* 2½ ins. steel under water deck through the whole length of the ship.

Gunboats.—Nine in number, of 150 to 240 tons; 200 to 400 indicated horse-power.

Torpedo boats.—Four sea-going, built and building, of 96 tons, 1300 indicated horse-power and 21½ knots speed; *first class*, five, and five to be built of 35 to 65 tons displacement, and *second class*, ten, and twelve building.

In addition there are paddle wheel vessels, school and training ships, a Royal Yacht and a Transport.

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EGYPT.

The ships now belonging to Egypt are:—

Mehemet Ali, an unarmoured iron frigate, 290 feet long, 36 feet broad; draught of water, 16 feet; displacement, 1762 tons. She is armed with 20 12-c.m. Krupp guns of 20 cwt. each, and 10 40-pdr. Armstrongs. The machinery has been removed. She is now used as a guard ship at Alexandra.

Sakkeh, a wood corvette, 210 feet long, 29 feet broad, 14½ feet draught of water, and 972 tons displacement. She is used as a guard ship at Port Said, and is armed with 10 40-pdr. B.L. Armstrongs. At present there is no machinery on board.

Mahroussa, paddle-wheel yacht of the Khedive. She is 440 feet long, 42 feet broad; draught of water, 20 feet; and displacement 4200 tons.

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FRANCE.—Armoured Ships.

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship, f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length at Water Line.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery or Turret.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
a.g.b. & b.	**Achéron*** . (steel)	1640	181 0	40 4	8	8	..	11 10	2	1700	1 27-c.m. 28-ton B.L.R., 2 10-c.m. do., 2 M.	..	1885	100,000	13·00	..	..
c.b.	**Alma** (*d*) . (wood)	3770	229 10	46 6	5⅞	4¾	26	23 11	1	1896	6 19-c.m. B.L.R., 4 12-c.m. do.	..	1867	101,200	11·89	..	..
b.	**Amiral Baudin** . (iron & steel)	11,380	321 6	69 10	21½	16½ steel	14	26 2	2	8320	3 37-c.m. (75 ton) B.L.R., 12 14-c.m. do., 8 M.	f. tu.	1883	600,000	15·00	800	3000
b.	**Amiral Duperré** (iron & steel)	11,100	311 0	66 11	21½	15½	14	26 9	2	8000	4 34-c.m. (48 ton) B.L.R., 1 16-c.m. do., 14-c.m. do., 12 M.	f. tu. or l. car	1879	570,000	14·22	..	..
c.b.	**Atalante** (*d*) (wood)	3800	229 10	46 6	6	4¾	26	23 3	1	1610	8 19-c.m. B.L.R., 4 12-c.m. do., 6 M.	..	1868	..	11·43	..	..
b.	**Bayard** . (wood)	6000	265 9	57 2	10	8	15	24 11	2	4000	4 24 c.-m. 16-ton B.L.R., 2 19-c.m. 8-ton do., 6 14-c.m. 3-ton do., 12 M., 2 l.	..	1880	..	14·00	400	..
c.s., t.	**Bélier** (*d*) . (wood)	3600	217 0	53 0	8½	7	31½	19 1	2	1921	2 24-c.m. 16-ton B.L.R. . .	..	1870	..	12·37	180	..
c.s.b.	**Belliqueuse** (*d*) (wood)	3706	230 0	46 3	6	4¾	26	22 10	1	1227	4 19-c.m. B.L.R., 4 16-c.m. do., 4 14-c.m. do., 6 M.	..	1865	99,176	11·78	..	..
c.s., t.	**Bouledogue** (*d*) (wood)	3400	217 0	53 0	8½	7	31½	18 2	2	1827	2 24-c.m. 16-ton B.L.R. . .	..	1872	..	12·25	180	..
t.	**Bouvines** . .	6590	283 9	57 5	18	17¾	..	22 0	2	7600	2 34-cm. B.L.R., 4 10-cm. Q.F., 4 47-mm. do., 4 37-mm. do.	2 f. tu. or l.car	Bldg.	556,000	17·0	..	..
b.	**Brennus** (steel)	10,826	344 6	65 0	17½ comp.	17¼ comp. & 4-in. on topsides.	..	27 10	3	13,000	3 34-c.m. B.L.R., 10 16-c.m. do., 7 M.	..	Bldg.	804,000	18·00	..	..
a.c.t.	**Bruix** . (steel)	4745	348 0	46 0	3½	..	..	19 2	2	8300	2 8-ton. B.L.R., 6 14-c.m. 3-ton do., 14 Q.F. and M.	..	Bldg.	360,000	19·00	..	..
c.s.b.	**Caiman** (iron and steel)	7230	278 3	59 0	19½	17¾	12	24 7	2	8000	2 42-c.m. 75-ton B.L.R., 4 10-c.m. do., 4 M.	..	1885	..	14·50	500	..
c.s., t.	**Cerbère** (*d*) (wood)	3800	196 10	53 0	8½	7	31½	19 7	2	1800	2 24-c.m. 16-ton B.L.R. . .	..	1868	137,600	11·39	..	..
a.c.t.	**Chanzy** . (steel)	4745	348 0	46 0	3½	..	..	19 2	2	8300	2 8-ton B.L.R., 6 14-c.m. 3-ton do., 14 Q.F. and M.	..	Bldg.	360,000	19·00	..	..
t.	**Charles Martel** (steel)	11,882	392 6	71 3	17¼	17¼	..	26 3	2	12,000	2 30-c.m. B.L.R., 2 27-c.m. do., 8 14-c.m. do., 4 65-mm. Q.F., 8 47-mm. do., 10 37-mm. do.	..	Bldg. at Brest	..	18·00	..	..

(*d*) Ships marked thus are, it is stated, unfit for service or for repair.

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FRANCE.—Armoured Ships—*continued.*

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length at Water Line.	Beam.	Armour. Belt.	Armour. Battery or Turret.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
a.c.t.	**Charner** . (steel)	4745	348 0	46 0	3½	..	..	19 2	2	8300	2 8-ton B.L.R., 6 14-c.m. 3-ton do., 14 Q.F. and M.	..	Bldg.	360,000	19·00	..	..
a.g.b. & b.	**Cocyte** . (steel)	1640	181 0	40 4	8	8	..	11 10	2	1700	1 27-c.m. 28-ton B.L.R., 2 10-c.m. do., 2 M.	..	1887	100,000	13·00	..	..
c.b.	**Colbert** . (wood)	8457	317 9	56 6	8½	6¼	34	28 5	1	4652	8 27-c.m. 23-ton B.L.R., 2 24-c.m. 16-ton do., 6 14-c.m. 3-ton do., 8 M.	..	1875	..	14·47	590	..
c.b. & b.	**Courbet** (iron & steel), formerly called Foudroyant.	9700	312 0	67 0	15	9½	..	25 0	2	8100	4 34-c.m. 48-ton B.L.R., 4 27-c.m. 28-ton do., 6 14-c.m. 3-ton do., 12 M.	4 f. tu. or l. car.	1881	800,000	14·20	628	3100
c.b. & b.	**Dévastation** (iron & steel)	10,100	312 0	67 0	15	9½	12½	25 0	2	8320	4 34-c.m. 48-ton B.L.R., 4 27-c.m. 23-ton do., 6 14-c.m. 3-ton do., 8 M.	4 f. tu. or l. car.	1879	..	15·17	610	2800
b.	**Duguesclin** (steel, sheathed with copper	5869	266 0	57 0	9	8 barbettes compound	15	25 3	2	4100	4 24-c.m. 16-ton B.L.R., 1 19-c.m. 8 ton do., 6 14-c.m. 3-ton do., 2 Q.F., 12 M.	..	1883	220,000	14·00	400	..
a.c.	**Dupuy de Lôme**	6297	376 0	51 6	4	4	..	23 0	2	14,000	2 19-c.m. 8-ton B.L.R., 6 16-c.m. 5-ton do., 8 Q.F., 8 M.	4 f. tu. or l.car	1890	Estimated 416,000	20·0	..	4000
a.g.b. & b.	**Flamme** . (special metal)	1045	165 0	32 7	10	4-in. shield	..	10 4	2	1500	1 24-c.m. 16-ton B.L.R., 1 9-c.m. do., 2 M.	1 f. tu.	1885	68,000	13·00	50	..
c.b.	**Flandre** (*d*) . (wood)	5997	295 3	56 6	6	4¼	26	27 6	1	3536	8 24-c.m. B.L.R., 5 19-c.m. do., 6 M.	..	1864	213,280	13·30	..	..
b.	**Formidable** (steel)	11,441	321 6	69 6	21½	17¾	14•	26 2	2	6500 8320 forced draught.	3 37-c.m. 75 ton B.L.R., 12 14-c.m. 3-ton do., 8 M.	f. tu.	1885	467,520 hull, 85,800 machinery.	15·00	600	..
c.b. & b.	**Friedland** . (iron)	8540	317 0	58 0	8	7	15	29 11	1	4428	8 27-c.m. 23-ton B.L.R., 8 14-c.m. 3-ton do., 1 12 c.m. do., 8 M.	2 f. tu. or l. car.	1873	..	13·30	630	..
c.s., t.	**Fulminant** (iron and steel)	5574	248 0	57 9	13	12	16	21 4	1	3550	2 27-c.m. 23-ton B.L.R., 4 12-c.m. do., 4 M.	2 l.car.	1877	..	13·22	275	..
c.s., b.	**Furieux** (iron & steel)	5700	247 10	59 0	20	17¾	..	21 9	2	4000	2 34-c.m. 48-ton B.L.R., 4 10-c.m., 4 M.	..	1883	264,640	14·00	290	1500

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a.g.b. & b.	**Fusée** (steel, copper sheathed)	1045	165	0	32	7	10	4-in. shield	..	10	4	2	1500	1 24-c.m. 16-ton B.L.R., 1 9 c.m. do., 2 M.	1 f. tu.	1884	68,000	13·00	50	..
„	**Grenade** (steel, copper sheathed)	1045	165	0	32	7	10	4-in. shield	..	10	4	2	1500	1 27-c.m. 16-ton B.L.R., 1 9-c.m. do., 2 M.	1 tu.	Bldg.	68,000	13·00	50	..
c.b.	**Héroine** . (iron)	5887	262	5	56	0	6	4½	26	27	7	1	3318	8 24-c.m. 16-ton B.L.R., 3 19-c.m. 8-ton do., 4 14-c.m. 3-ton do., 6 M.	..	1863	213,000	13·00	500	..
b.	**Hoche** (iron & steel)	10,650	333	0	65	7	18	16	..	27	3	2	7000	2 34-c.m. 52-ton B.L.R., 2 27-c.m. 28-ton do., 18 14-c.m. 3-ton do., 8 M.	4 f. tu. or l. r.	1886	380,000 hull, 120.000 machinery	15·00	600	4000
Armoured floating battery	**Imprenable** (*d*) (iron)	1420	129	6	51	10	5½	4½	16	11	3	2	411	2 24-c.m. B.L.R., 2 16-c.m. do., 2 12-c.m. do.	..	1867	..	5·51	..	..
c.s., b.	**Indomptable** (iron and steel)	7168	279	10	59	0	20	17½	..	23	6	2	6000	2 42-c.m. (75-ton) B.L.R., 4 10-c.m., 4 M.	..	1883	..	14·50	800	..
t.	**Jauréguiberry** . (steel)	11,818	356	0	72	8	17¾	14½	..	27	9	2	13,275	2 30-c.m. B.L.R., 2 27-c.m. do., 8 14-c.m. do., 4 65-mm. Q.F., 12 47-mm. do., 8 37-mm. do.	6 f. tu. or l.car	Bldg.	..	17·0	..	..
c.s., t.	**Jemmapes** . .	6590	283	9	57	5	18	17¾	..	22	0	2	7500	2 34-c.m. B.L.R., 4 10-c.m. Q.F., 4 47-m.m. do., 4 37-m.m. do.	2 f. tu. or l.car	Bldg.	500,000	16·5	..	..
c.b. & b.	**La Galissonnière** (wood)	4700	255	8	49	0	6	4¾	26	23	9	2	2370	6 24-c.m. 16-ton B.L.R., 6 14-c.m. 3-ton do., 6 M.	..	1872	..	13·08	500	..
a.c., t.	**Latouche Treville** (steel)	4745	348	0	46	0	3½	3¾ conning tower.	..	19	2	2	8300	2 8-ton B.L.R., 6 47-c.m. 3-ton do., 14 Q.F. and M.	..	Bldg.	360,000	19·00	..	..
t.	**Lazare Carnot** (steel)	12,000	380	0	70	6	17¾	10	..	26	0	2	12,400	2 30-c.m. B.L.R., 2 27-c.m. do., 8 14-c.m. do., 4 65-m.m. Q.F., 8 47-m.m. do., 10 37-m.m. do.	..	Bldg. at Toulon	..	18·0	..	..
b.	**Magenta** (iron and steel)	10,581	330	0	65	7	18	16	..	27	3	2	7000	4 34-c.m. 52-ton B.R.L., 17 14-c.m. 3-ton do., 20 M.	4 f. tu. or l. car.	1890	760,960	15·00	600	4000
b.	**Marceau** (iron & steel)	10,581	330	0	65	7	18	16	..	27	3	2	7000	4 34-c.m. 52-ton B.L.R., 17 14-c.m. 3-ton do., 20 M.	4 f. tu. or l.car	1887	769,080	15·00	600	4000
c.b. & b.	**Marengo** . (wood)	7900	282	6	56	10	8	6¼	32	27	8	1	3673	4 27-c.m. 27-ton B.L.R., 4 24-c.m. 16-ton do., 7 12-c.m. do., 12 M.	..	1869	280,000	13·49	650	..
a.g.b. & b.	**Mitraille** (steel, sheathed with copper)	1045	165	0	32	7	10	4-in. shield	..	10	4	2	..	1 27-c.m. 16-ton B.L.R., 1 9-c.m. do., 2 M.	1 f. tu.	1886	70,000	13·00	50	..
c.b.	**Montcalm** (*d*) (wood)	3621	230	3	46	1	5⅞	4¾	26	23	7	1	1830	6 19-c.m. 8 ton B.L.R., 4 12-c.m., do., 8 M.	..	1868	..	11·65	..	..

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FRANCE.—Armoured Ships—*continued.*

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length at Water Line.	Beam.	Armour. Belt.	Armour. Battery or Turret.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
b.	**Neptune** (iron & steel)	10,581	330 0	65 7	18	16 barbettes	..	27 3	2	7000	4 34-c.m. 52-ton B.L.R., 17 14-c.m. 2½-ton do., 20 M.	4 f. tu. or l. car.	1887	780,000 including armament	15·00	600	4000
c.b. & b.	**Océan** . (wood)	7500	282 6	56 10	8	6¼	32	27 3	2	3781	4 27-c.m. 23-ton B.L.R., 4 24-c.m. 16-ton do., 8 14-c.m. 3-ton do., 8 M.	..	1868	..	13·70	650	..
c.s., t.	**Onondaga** (*d*) (iron)	2600	228 4	51 2	5½	12¾	12	12 7	2	642	4 24-c.m. 16-ton B.L.R. .	..	1863	..	6·46	170	..
a.g. & b. b.	**Phlégéthon** (steel)	1640	181 10	40 4	8	8	..	11 10	2	1700	1 27-c.m. 28-ton B.L.R., 1 12-c.m. do., 2 M.	..	1890	142,000	13·00	..	..
Armoured floating battery	**Protectrice** (*d*) (iron)	1420	129 6	51 10	5½	4¼	15¾	12 0	2	..	4 19-c.m. 8-ton B.L.R., 1 l. .	..	1866	..	6·0	..	..
c.b.	**Provence** (*d*) (wood)	5819	262 5	55 10	6	4¼	26	27 2	2	3064	8 24-c.m. B.L.R., 3 19-c.m. do., 2 14-c.m. do., 3 12-c.m. do.	..	1863	..	13·70	..	..
c.b. & b.	**Redoutable** (iron & steel)	8860	318 2	64 8	14	9½	15	25 6	2	6071	8 27-c.m. 24-ton B.L.R., 6 14-c.m. 3-ton. do., 8 M.	..	1876	..	14·66	510	2800
c.b.	**Reine Blanche** (*d*) (wood)	3900	230 3	46 2	6	4¾	26	23 8	1	1860	6 16-c.m. 8-ton B.L.R., 4 12-c.m. 3-ton do., 6 M.	..	1868	..	11·80	250	..
c.s., b.	**Requin** . (iron & steel)	7200	279 10	59 0	19½	17¾	..	24 7	2	6000	2 42-c.m. 75-ton B.L.R., 4 10-c.m. do., 4 M.	..	1885	..	14·00	500	..
c.b.	**Revanche** (*d*) (wood)	5819	262 5	55 10	6	4½	26	27 1	2	3187	8 24-c.m. 16-ton B.L.R., 3 19-c.m. 8-ton do., 4 14-c.m. 3-ton do.	..	1865	..	13·25	500	..
c.b. & b. t.	**Richelieu** (wood)	9100	323 6	57 10	8½	6¼	..	27 11	2	4006	6 27-c.m. 23-ton B.L.R., 5 24-c.m. 16-ton do., 8 14-c.m. 3-ton do., 12 M.	..	1873	..	13·11	640	..
c.b.	**Savoie** (*d*) . (wood)	6000	262 5	55 10	6	4¼	26	28 0	1	3318	8 24-c.m. 16-ton B.L.R., 3 19-c.m. 4 14-c.m. do.	..	1864	..	13·47	..	..

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a.g.b. & b.	**Styx** .	(steel)	1040	181	10 40	4	8	8	..	11	10	2	1700	1 27-c.m. 27-ton B.L.R., 1 12-c.m., 2 M.	..	Bldg.	142,000	13·00	..	..
c.b. & b.	**Suffren** .	(wood)	7600	282	6 57	10	8	6¼	32	29	10	1	4288	4 27-c.m. 23-ton B.L.R., 4 24-c.m. 9½-ton do., 6 14-c.m. 3-ton do., 12 M.	4 f. tu. or l. car.	1870	..	14·30	700	..
c.s., b.	**Taureau** (*d*)	(wood)	2700	194	9 47	3	6	4¾	26	17	9	2	1800	1 27-c.m. 24-ton B.L.R. . .	..	1865	..	12·54	170	..
c.s., t.	**Tempête**	(iron & steel)	4523	248	0 57	9	13	12	15¾	16	9	1	1745	2 27-c.m. 28-ton B.L.R., 4 M. .	..	1876	..	10·20	120	..
c.s., b.	**Terrible**	(iron & steel)	7200	279	10 59	0	19½	17¾	..	24	7	2	6000	2 42-c.m. 75-ton B.L.R., 4 10-c.m. do., 4 M.	..	1881	..	14·50	500	..
c.b.	**Thétis** (*d*) .	(wood)	3621	230	3 46	2	6	4¾	26	20	10	1	1859	6 19-c.m. 8-ton B.L.R., 4 14-c.m. do., 6 M.	..	1877	..	12·00	250	..
c.s., t.	**Tigre** (*d*) .	(wood)	3600	216	6 52	10	9	7	..	18	9	2	1880	2 24-c.m. 16-ton B.L.R. . .	..	1871	..	12·09	180	..
c.s., b.	**Tonnant**	(iron & steel)	4707	248	7 58	5	18	14½	15¾	17	3	1	1760	2 34-c.m. 48-ton B.L.R., 4 M. .	..	1880	..	11 00	120	..
c.s., t.	**Tonnerre**	(iron & steel)	5700	248	0 57	9	13	12	15¾	21	4	1	4165	2 27-c.m. 28-ton B.L.R., 4 10-c.m. 4 M.	..	1875	..	14·01	285	..
c.s., t.	**Tréhouart** .	(steel)	6590	283	9 57	5	18	17¾	..	22	0	2	7500	2 34-c.m. B.L.R., 4 10-c.m. Q.F., 4 47 m.m. do., 4 37 m.m. do.	2 f. tu. or l. car	*	556,000	17·0	..	..
c.b. & b.	**Trident** .	(wood)	8800	317	9 56	4	8½	6¼	34	29	1	1	4652	8 27-c.m. 23-ton B.L.R., 2 24-c.m. 16-ton do., 6 14-c.m. 3-ton do., 4 M.	2 f. tu. or l. car.	1876	..	14·17	540	..
,,	**Triomphante**	(wood)	4700	258	2 48	9		4¾	26	22	5	1	2200	6 24-c.m. 16-ton B.L.R., 1 19-c.m. 8-ton do., 8 14-c.m. 3-ton do., 1 12-c.m. do.	..	1877	..	12·89	500	..
b.	**Turenne** .	(wood)	6400	265	9 57	2	10	8	15	23	11	2	3955	4 24-c.m. 16-ton B.L.R., 2 19-c.m. 8-ton do., 6 14-c.m. 3-ton do., 12 M.	..	1879	..	14·14	400	..
c.b.	**Valeureuse** (*d*)	(wood)	5774	262	5 56	4	6	4¼	..	27	6	1	3383	8 24-c.m. B.L.R., 1 19-c.m. 8-ton do., 6 16-c.m. do., 1 12-c.m. do.	..	1864	..	13·83	..	..
c.s., t.	**Valmy** . . .		6590	283	9 57	5	18	17¾	..	22	0	2	7500	2 34-c.m. B.L.R., 4 10-c.m. Q.F., 4 47 m.m. do., 4 37 m.m. do.	2 f. tu. or l. car	Bldg.	556,000	17·0	..	..
b.	**Vauban** .	(steel)	5900	267	9 57	3	10	8	15	24	0	2	4060 (forced draught)	4 24-c.m. 16-ton B.L.R., 1 19-c.m. do., 614-c.m. 3-ton do., 12 M.	..	1882	..	14·32 forced draught.	400	..
c.s., t.	**Vengeur**	(iron & steel)	4523	248	0 57	9	13	12	15¾	16	9	2	2319	2 34-c.m. 48-ton B.L.R., 4 M. .	..	1878	..	10·83	120	..
c.b. & b.	**Victorieuse**	(wood)	4600	258	2 48	9	6	4¾	26	22	5	1	2214	6 24-c.m. 16-ton B.L.R., 1 19-c.m. 8-ton do., 4 14-c.m. 3-ton do., 2 10-c.m. do.	..	1875	..	12·75	300	..

(*d*) Ships marked thus are, it is stated, unfit for service or for repair.

* Building at Lorient.

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FRANCE.—Unarmoured Ships.

The divisions of the French unarmoured ships follow the official classification. The designation of each class is made, wherever practicable, to correspond with the usual parallel English equivalent. The French system of nomenclature is based on two distinct principles—that of the design of a ship, and that of the service for which a ship is intended. *Eclaireurs d'Escadre* are classed as sloops, that being the nearest English equivalent. *Avisos* are classed as despatch vessels to distinguish them from the *Canonnières de Station*, classed as gun-vessels. The *Canonnières de Station* differ little from British sea-going gun-*boats*; they have been classed as gun-*vessels* to distinguish them from the several kinds of French gun boats.

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P. deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Dis-chargers for Tor-pedoes.					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
fr.c.	**Alger** P	4160	346 0	45 3	steel	19 6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do., 4 Q.F., 6 M.	4 f. tu. or l.car	1889	280,000	19·00	..	..
fr.c.	**Aréthuse**	3400	277 6	43 6	wood	21 9	1	4200	4 16-c.m. 5-ton B.L.R., 22 14-c.m. 3-ton. do., 8 M.	..	1882	..	14·00	..	..
g.v.	**Aspic**	480	145 4	23 10	composite	10 6	1	453	2 14-c.m. 3-ton B.L.R., 2 10-cm. 24-cwt. do.	..	1880	..	10·30	..	..
sl.	**Beautemps-Beaupré**	1350	204 8	34 2	wood	15 10	1	985	6 14-c.m. 3-ton B.L.R., 4 M.	..	1872	..	12·60	..	..
d.v.	**Bisson**	880	199 5	28 5	wood	12 8	1	849	3 14-c.m. 3-ton B.L.R., 1 10-c.m. 24-cwt. do., 5 M.	..	1874	..	11·78	..	..
to.g.b.	**Bombe**	320	196 10	21 7	steel	5 11	2	1800	3 3-in. Q.F., 3 M.	2 f. tu. or l.car	1885	..	*18·00	..	..
sl.	**Bougainville**	800	182 0	31 9	wood	12 9	1	449	6 12-c.m. B.L.R.	..	1859	..	9·34	..	..
d.v.	**Bourayne**	1290	204 8	34 4	wood	15 10	1	768	6 14-c.m. B.L.R., 2 M.	..	1869	..	11·20	..	..
d.v.	**Boursaint**	780	198 4	28 0	wood	12 8	1	679	1 14-c.m. 3-ton B.L.R., 2 10 c.m. 3-ton do., 4 M.	..	1872	..	11·51	..	..
„	**Bouvet**	870	197 6	28 0	wood	12 2	1	817	3 14-c.m. 3-ton B.L.R., 1 10-c.m 24-cwt., do., 3 M.	..	1876	..	11·39	..	..
cr. 2nd class	**Bugeaud** P.	3712	308 0	43 6	steel	20 10	2	9000	6 16-c.m. Q.F., 4 10-c.m. do., 8 47-m.m. do., 12 37-m.m. do.	6 f. tu. or l.car	Bldg.	..	19·5	..	..

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g.v.	**Capricorne** . . .	480	148	4	23	10	wood	10	5	1	443	2 14-c.m. 3-ton B.L.R., 2 10-c.m. 24 cwt. do.	..	1882	..	11·18	..	..
to.g.b.	**Cassini**	850	..		..		..	..		..	..	.. ..	..	Bldg.	..	..	..	..
tr., cr.	**Catinat**	450	197	0	23	0	steel	10	6	2	2200	1 6½-c.m. Q.F., 3 other Q.F., 2 M. .	..	Bldg.	..	18·5	..	..
fr.c.	**Cecille** . . . P.	5766	378	9	49	3	iron and steel	19	9	2	9600	6 16-c.m. 5-ton B.L.R., 10 14-c.m. 3-ton do., 3 Q.F., 10 M.	4 f. tu. or l.car	1888	hull, 181,666; engines, 116,000.	19·00	..	..
cr. 2nd class	**Chasseloup-Laubat** . P.	3712	308	0	43	6	steel	20	10	2	9000	6 16-c.m. Q.F., 4 10-c.m. do., 8 47-m.m. do., 12 37-m.m. do.	6 f. tu. or l.car	Bldg.	..	19·5		..
g.v.	**Chacal**	460	142	6	24	4	wood	9	5	2	251	1 14-c.m. 3-ton B.L.R., 1 10-c.m., 24 cwt. do., 2 M.	..	1868	..	9·13	..	..
cr.	**Champlain**	2000	258	10	35	8	wood	16	0	1	1953	10 14-c.m. 3-ton do. . . .	..	1872	..	14·29	..	..
d.v.	**Chasseur**	930	199	5	28	5	wood & iron	12	7	1	850	4 14-c.m. 3-ton B.L.R. 4 M. 1 l. .	..	1878	..	11·06	..	..
cr.	**Château Renault** . .	1850	262	2	35	3	wood	18	2	1	1701	7 14-c.m. 3-ton B.L.R. . . .	..	1868	..	14·27	..	..
„	**Clorinde** (Requires repair) .	1800	..		..		..	..		..	..	12 16-c.m. 5-ton B.L.R. . .	..	1857	..	10·00	..	..
cr.	**Coetlogon** . . P.	1850	312	0	30	5	steel	14	0	2	6000	4 14-c.m. B.L.R, 3 Q.F., 4 M. .	5 f. tu. or l.car	1889	134,000	19·50	200	2400
g.v.	**Comète**	495	151	6	24	9	composite	10	6	1	450	2 14-c.m. B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	..	..	..
to.cr.	**Condor**	1280	216	6	29	3	steel	15	5	2	3800	5 10-c.m. 24 cwt. B.L.R., 6 M. .	5 f. tu. or l.car	1885	80,000	17·70	..	..
cr.	**Cosmao** . . . P.	1850	312	0	30	5	steel	14	0	2	6000	2 14-c.m. 3-ton B.L.R., 3 Q.F., 4 M.	5 f. tu. or l.car	1888	133,000	19·50	200	2400
g.v.	**Crocodile**	450	141	10	24	0	composite	9	5	1	441	2 14-c.m. B.L.R.	..	1874	..	9·68	..	..
to.g.b.	**Couleuvrine** . . .	320	196	10	21	7	steel	5	11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu. or l.car	1885	..	18·00	..	..
„	**Dague**	320	196	10	21	7	steel	5	11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu. or l.car	1885	..	18·00	..	..
cr.	**Davout** . . . P.	3027	297	6	40	0	steel	17	6	2	9000	4 16-c.m. B.L.R., 4 Q.F., 6 M. .	4 f. tu. or l.car	Bldg.	..	20·00	480	400 12½ kts.
sl.	**Dayot**	1350	204	8	34	4	wood	15	10	1	917	1 16-c.m. 5-ton B.L.R., 5 14-c.m. do., 2 M.	..	1869	..	11·76	..	..
cr.	**Decrès** (Requires repair) .	1800	244	3	38	8	wood	18	2	1	1478	1 16-c.m. 5-ton B.L.R., 9 14-c.m. 3-ton do.	..	1866	..	12·04	..	..
cr.	**Desaix**	1700	259	2	34	8	wood	17	7	1	1442	4 10-c.m. B.L.R., 2 M. . . .	..	1866	..	14·21	..	..
„	**D'Estaing**	2400	262	5	37	5	wood & iron	18	8	1	3700	15 14-c.m. 3-ton B.L.R., 10 M. .	..	1879	..	15·31	..	..
sl.	**D'Estrées** (Requires repair) .	1340	207	4	34	0	wood	15	9	1	1003	1 16-c.m. 5-ton B.L.R., 5 14-c.m. 3-ton do., 2 M.	..	1867	..	12·30	..	..

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FRANCE.—Unarmoured Ships—*continued.*

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Dischargers for Fish Torpedoes.	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
to.g.b.	Dragonne . . .	320	196 10	21 7	steel	5 11	2	1800	3 3-inch Q.R., 3 M. . . .	2 f. tu. or l.car	1885	..	18·00	..	..
fr.c.	Dubourdieu . . .	3400	253 7	46 6	wood	22 10	1	3300	4 16-c.m. 5-ton B.L.R. 14 14-c.m. 3-ton B.L.R.	1 f. tu. or l.car	1884	154,553	14·00	..	..
sl.	Duchaffault . . .	1340	204 8	34 2	wood	16 0	1	1214	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1872	..	12·72	..	..
,,	Ducouedic . . .	1340	204 8	34 2	wood	16 6	1	769	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1869	..	11·57	..	..
cr.	Duguay Trouin . . .	3300	296 3	43 4	iron & wood	20 6	1	3740	5 19-c.m. 8-ton B.L.R., 5 14-c.m. 3-ton. do.	2 f. tu. or l.car	1877	..	15·90	430	..
g.v.	Dumont d'Urville .	860	201 11	28 6	wood	13 8	1	850	4 14 c.m. 3-ton B.L.R. . . .	..	1878	..	11·60	..	..
cr.	Du Petit Thouars . .	2000	257 10	35 9	wood	16 0	1	2018	10 14-c.m. 3-ton B.L.R. . . .	..	1874	..	15·07	..	..
fr.cr.	Duquesne	5800	333 5	50 3	iron & wood	25	1	6589	7 19-c.m. 8-ton B.L.R., 14 14-c.m. 3-ton do., 8 M. 1 l.	..	1876	..	16·90	600	..
cr.	Éclaireur	1830	236 3	35 5	iron & wood	17 0	1	2050	8 14-c.m. 3-ton B.L.R., 2 M. . .	..	1877	..	15·00	..	..
to.cr.	Epervier	1280	216 6	29 3	steel	15 5	2	3200	5 10-c.m. B.L.R., 6 M. . . .	5 f. tu. or l.car	1885	80,000	17·00	..	..
g.v.	Etendard	510	142 6	24 4	wood	9 5	2	232	1 19-c.m. B.L.R., 1 12-c.m. do. .	..	1868	..	9·00	..	..
g.v.	Étoile	450	149 3	24 7	composite	8 4	2	450	2 14-c.m. 3-ton B.L.R., 2 10-c.m. do., 2 M.	..	1885	..	10·00	..	..

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cr.	**Fabert**		2100	249	4	6	30	wood	18	4	1	1107	8 14-c.m. 5-ton B.L.R.	..	1874	..	12·42	..	..
g.v.	**Fanfare**		510	142	0	24	4	„	9	5	2	233	1 19-c.m. B.L.R., 1 12-c.m. do.	..	1868	..	8·39	..	..
to.cr.	**Faucon**		1280	216	6	29	3	steel	15	5	2	3200 (forced draught)	5 10-c.m. B.L.R., 6 M.	5 f. tu. or l.car	1887	80,000	17·5	..	..
to.g.b.	**Fleche**		320	196	10	21	7	„	5	11	2	1800	3 3-inch Q.F., 3 M.	2 f. tu. or l.car	1885	..	18·00	..	..
to.cr.	**Fleureus**		1310	230	0	29	6	„	15	0	2	4000	5 10-c.m. B.L.R., 2 6½-c.m., do. 4 Q.F.	..	Bldg.	116,000	18·0	..	..
cr.	**Forbin**	P.	1850	312	0	30	5	„	16	0	2	6000	2 14-c.m. 3-ton B.L.R., 3 Q.F., 4 M.	5 f. tu. or l.car	1888	..	19·50	200	2400
„	**Forfait**		2400	249	4	38	0	wood & iron	18	0	1	2764	15 14-c.m. 3-ton B.L.R., 2 l., 6 M.	..	1879	..	13·44	..	..
cr.	**Friant**	P.	about 3000	Design not yet decided on.															
g.v.	**Fulton**		825	199	5	28	5	wood	12	8	1	850	4 14-c.m. 3-ton B.L.R.	..	1887	37,000	13·00	..	..
„	**Gabes**		490	151	6	24	9	comp.	10	6	1	450	2 14-c.m. B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	11·00	..	..
„	**Gladiateur**		490	142	0	24	4	wood	9	5	2	218	1 14-c.m. B.L.R., 1 12-c.m. do., 2 M.	..	1868	..	9·50	..	..
sl.	**Hamelin**		1340	207	7	34	2	„	15	10	1	1155	1 16-c.m. B.L.R., 5 14-c.m. B.L.R., 2 M.	..	1866	..	12·58	..	..
d.v.	**Hirondelle**		1040	249	6	30	4	„	12	8	2	1780	2 19-c.m. 24-cwt. B.L.R.	..	1869	..	15·50	..	..
sl.	**Hugon**		1340	204	5	34	2	„	15	10	1	1054	6 14-c.m. 3-ton B.L.R., 2 M.	..	1872	..	11·72	..	..
d.v.	**Hussard**		880	201	10	28	6	„	13	7	1	850	4 14-c.m. 3-ton B.L.R.	..	1877	..	12·08	..	..
g.v.	**Hyène**		470	142	0	24	5	„	9	5	2	258	1 14-c.m. B.L.R., 1 10-c.m. do.	..	1868	..	9·06	..	..
to.g.b.	**Iberville**		850	..		..		..	..		..	..	.. ..	..	Bldg.	..	..	..	..
d.v.	**Inconstant**		825	199	5	28	5	„	12	7	1	850	4 14-c.m. 3-ton B.L.R.	..	1886	37,000	13·00	..	..
cr.	**Infernet**		1931	262	2	35	9	„	18	4	1	1815	8 14-c.m. 3-ton B.L.R.	..	1869	..	13·90	..	..

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FRANCE.—Unarmoured Ships—*continued.*

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
fr.c.	Iphigénie (Training ship) .	3200	244 6	46 6	wood	22 4	1	2800	2 16-c.m. 5-ton B.L.R., 18 14-c.m. 3-ton do., 10 M., 3 l.	..	1881	..	14·60	..	..
fr.cr.	Isly . . . . P.	4160	346 0	43 6	steel	19 6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do., 4 Q.F., 6 M.	4 f. tu. or l.car	Bldg.	283,240	19·00	..	..
Torpedo Depôt Ship.	Japon	3970	315 0	39 0	iron	19 6	1	1500	1 14-c.m. 3-ton B.L.R., 1 10-c.m. do.	..	1859	..	12·4	..	..
fr.c.	Jean Bart . . . P	4160	346 0	43 6	steel	19 6	2	8000	4 16-c.m. 5-ton B.L.R., 6 14-c.m. 3-ton do.	4 f. tu. or l.car	1889	283,240	19·00	..	..
sl.	Kerguelen	1340	204 5	34 2	wood	15 10	1	1200	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1872	..	12·76	..	..
d.v.	Labourdonnais . . .	860	199 5	28 5	„	12 7	1	787	4 14-c.m. 3-ton B.L.R. . . .	..	1875	..	11·69	..	..
cr.	Laclocheterie . . .	2100	262 2	35 9	„	18 4	1	1918	8 14-c.m. 3-ton B.L.R., 2 l. . .	..	1872	..	13·73	300	..
„	Lalande . . . P.	1877	311 6	31 2	steel	14 0	2	6000	2 14-c.m. B.L.R., 3 Q.F., 4 M. .	5 f. tu. or l.car	1888	133,800	19.50	200	2400
to.g.b.	Lance	320	196 10	21 7	„	5 11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu. or l.car	1886	..	18·00	.	..
cr.	Lapérouse	2400	262 5	37 5	wood & iron	18 8	1	2280	15 14-c.m. 3-ton B.L.R., 6 M., 2 l. .	..	1877	..	14·73	..	..
to.g.b.	Lavoisier	450	197 0	23 0	steel	10 6	2	2200	1 6½-c.m. Q.F., 3 other Q.F., 2 M. .	..	Bldg.	52,000	18·5	..	..

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to.g.b.	**Leger**	450	197	0	23	0	steel	10	6	2	2200	1 6½-c.m. Q.F., 3 other Q.F., 2 M.	..	Bldg.	52,000	18·5	..	..
to.g.b.	**Levrier**	450	197	0	23	0	„	10	6	2	2200	1 6½-c.m. Q.F., 3 other Q.F., 2 M.	..	Bldg.	52,000	18·5	..	..
sl.	**Limier**	1330	207	4	34	0	wood	15	10	1	1084	6 14-c.m. 3-ton B.L.R., 2 M.	..	1866	..	11·80	..	..
„	**Linois** (Requires repair)	1210	203	5	32	2	„	15	2	1	720	6 14-c.m. 3-ton B.L.R., 2 M.	..	1867	..	11·50	..	..
g.v.	**Lion**	470	151	6	24	9	composite	10	6	1	400	2 14-c.m. 3-ton B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	11·00	..	..
„	**Lionne**	500	141	9	23	11	„	9	6	1	426	1 14-c.m. B.L.R., 2 M., 2 l.	..	1877	..	9·81	..	..
„	**Lutin**	490	141	9	23	11	„	9	4	1	427	2 14-c.m. B.L.R., 2 l.	..	1877	..	10·00	..	..
„	**Lynx**	485	141	9	23	11	„	9	4	1	427	2 14-c.m. B.L.R., 2 l.	..	1878	..	10·38	..	..
cr.	**Magon**	2390	249	4	38	0	wood & iron	18	0	1	2462	15 14-c.m. 3-ton B.L.R., 6 M., 2 l.	..	1881	..	14·17	..	..
g.v.	**Météore**	470	151	6	24	9	composite	10	6	1	450	2 14-c.m. B.L.R., 2 10-c.m. do., 2 M.	..	1884	..	10·00	..	..
sl.	**Milan**	1540	303	2	32	10	steel	14	7	2	4132	4 10-c.m. B.L.R., 8 M.	2 f. tu. or l.car	1886	..	18·00	..	..
fr.c.	**Minerve** (Requires repair)	2800	246	9	42	8	wood	21	4	1	1601	14 14-c.m. 3-ton B.L.R., 5 M.	..	1865	..	10·91	..	..
fr.c.	**Naiade**	3500	246	0	47	2	wood & iron	22	10	1	3260	2 16-c.m. 5-ton B.L.R., 18 14-c.m. 3-ton do., 4 M., 1 l.	4 f. tu. or l.car	1881	..	13·68	..	..
cr.	**Nielly**	2300	262	5	37	5	„	18	8	1	2921	15 14-c.m. 3-ton B.L.R., 10 M.	..	1880	..	15·23	..	..
d.v.	**Papin**	825	199	6	28	6	„	13	7	1	850	4 14-c.m. 3-ton B.L.R.	..	1886	37,000	13·00	..	..
d.v.	**Parseval**	790	197	6	28	0	„	12	2	1	817	4 14-c.m. 3-ton B.L.R.	..	1879	..	12·33	..	..
cr.	**Primauguet**	2400	262	5	37	5	wood & iron	18	8	1	2268	15 14-c.m. 3-ton B.L.R., 10 M.	..	1882	..	14·50	..	..
sl.	**Rigault de Genouilly**	1710	236	3	35	5	wood and iron topsides	17	0	1	2050	8 14-c.m. 3-ton B.L.R., 2 M.	..	1876	..	14·49	..	..
cr.	**Roland**	2300	249	4	38	0	„	17	7	1	2700	15 14-c.m. 3-ton B.L.R., 6 M.	..	1882	..	14·50	..	..
g.v.	**Sagittaire**	490	148	4	23	10	„	10	5	1	427	2 14-c.m. B.L.R., 2 10-c.m. do.	..	1881	..	11·05	..	..

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FRANCE.—Unarmoured Ships—*continued.*

cr., cruiser; *d.v.*, despatch vessel; *fr.c.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; *to.cr.*, torpedo cruiser; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Dischargers for Torpedoes.	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at ten knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
to.g.b.	Sainte Barbe . . .	320	196 10	21 7	steel	5 11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu. or l.car	1885	..	18·00	..	..
„	Salve	320	196 10	21 7	„	5 11	2	1800	3 3-inch Q.F., 3 M. . . .	2 f. tu. or l.car	1886	..	18·00	..	..
cr.	Sané	1900	255 0	36 0	wood	18 4	1	1998	6 14-c.m. 3-ton B.L.R. . . .	..	1870	..	15·02	..	..
g.v.	Scorpion	470	151 6	24 9	composite	10 6	1	450	2 14-c.m. 3-ton B.L.R., 2 10-c.m. do.	..	1883	..	11·00	..	..
sl.	Segond	1280	204 8	34 2	wood	15 10	1	894	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1869	..	11·26	..	..
cr.	Seignelay	1900	255 0	36 0	„	18 4	1	1967	8 14-c.m. 3-ton B.L.R. . . .	..	1874	..	15·00	..	..
fr.c.	Sfax . . . P.	4488	288 9	49 3	steel&wood	24 9	2	6034	6 16-c.m. 5-ton B.L.R., 10 14-c.m. 3-ton do., 3 Q.F., 5 M.	5 f. tu. or l.car	1884	200,000	16·84	800	..
cr.	Suchet . . . P.	3027	297 6	40 0	steel	17 6	2	9000	4 16-c.m. B.L.R., 4 Q.F., 6 M. .	4 f. tu. or l.car	Bldg.	202,760	20·00	480	4000 at 12½ kts.
„	Surcouf . . . P.	1850	312 0	30 5	„	14 0	2	6000	2 14-c.m. 3-ton B.L.R., 3 Q.F., 4 M..	5 f. tu. or l.car	1888	131,200	19·50	200	2400
fr.cr.	Tage . . . P.	7045	390 0	53 8	„	22 10	2	10,330	6 16-c.m. 5-ton B.L.R., 10 14-c.m. 3-ton do., 3 Q.F., 12 M.	7 f. tu. or l.car	1886	..	19·00	800	..

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sl.	**Talisman** (Requires repair) .	1410	224	9	33	6	wood	15	5	1	691	4 14-c.m. 3-ton B.L.R., 2 10-c.m. do., 2 M.	..	1862	..	11·28	..	..
fr.c.	**Tourville**	5600	333	5	50	3	iron & wood	25	4	1	7466	7 16-c.m. 5-ton B.L.R., 14 14-c.m. 3-ton do., 1 l.	..	1876	..	16·89	800	..
	Troude . . . P.	1877	311	6	31	2	steel	14	0	2	6000	2 14 c.m. 3-ton B.L.R., 7 M. . .	5 f. tu. or l.car	1888	..	19·50	200	2400
sl.	**Vaudreuil**	1280	204	8	34	1	wood	15	10	1	867	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1870	..	11·00	..	..
to.cr.	**Vautour**	1280	216	6	29	3	steel	15	5	2	3200	5 10-c.m. B.L.R., 6 M. . . .	5 f. tu. or l.car	1886	80,000	17·50	..	..
fr.c.	**Vénus**	2800	246	9	42	8	wood	21	4	1	1308	16 14-c.m. B.L.R., 6 M. . .	..	1864	..	12·57	..	..
cr.	**Villars**	2400	249	4	38	0	wood & iron	17	7	1	2380	15 14-c.m. 3-ton B.L.R., 6 M. .	..	1879	..	14·25	..	..
g.v.	**Vipère**	490	145	4	23	10	composite	10	6	1	427	2 14-c.m. B.L.R., 2 10-c.m. do. .	..	1881	..	10·30	..	..
d.v.	**Volage**	510	160	5	28	3	wood	11	9	1	401	2 9-c.m. B.L.R., 2 M. . . .	..	1881	..	10·76	..	..
sl.	**Volta** (Requires repair) .	1350	207	8	33	9	„	15	7	1	1066	6 14-c.m. 3-ton B.L.R., 2 M. . .	..	1867	..	12·94	..	..
d.v.	**Voltigeur**	910	199	5	28	5	wood & iron	12	7	1	850	4 14-c.m. 3-ton B.L.R. . . .	..	1878	..	12·48	..	..
tr.cr.	**Wattignies**	1310	230	0	29	6	steel	15	0	2	4000	5 10-c.m. B.L.R., 2 6½-c.m. do., 4 Q.F.	..	Bldg.	116,760	18·0	..	..

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Besides transports, of which there is a large number, store ships, surveying vessels, training ships, yachts, sailing vessels, &c., there are, on the List of the French Navy, the following:—

River and local (screw) despatch vessels (Avisos de flotille).—Actif, Chimère, Corse, Cuvier, Élan, Ibis, Loyalty, Mouette. 240 to 410 tons; 205 to 417 I.H.P.

River and local (paddle) despatch vessels (Avisos de flotille).—Albatros, Alcyon, Alouette, Ardent, Basilic, Bengali, Brandon, Cigale, Cigogne, Écureuil, Goëland, Gogah, Héron, Jouffroy, Lézard, Magicien, Mesange, Oyap-ock, Pétrel, Pingouin, Pluvier, Rapide, Salamandre, Travailleur, Vigilant.

River (screw) gunboats (Chaloupes canonnières).—Alerte, Arquebuse, Avalanche, Bäionette, Bouclier, Bourrasque, Carabiné, Caronade Casse-tête Cimeterre, Épée, Escopette, Estoc, Flamberge, Framée, Glaive, Hache, Harpon, Javeline, Javelot, Massue, Mitrailleuse, Mousqueton, Mutine, Oluma (building for the Congo), Perrier, Rafale, Redoute, Revolver, Sagaie, Tirailleuse, Tromblon, Yatagan.

River (paddle) gunboats (Chaloupes canonnières). — Berthe-de-Villars, Biche, Bobillot, Bossant, Chamois, Cuvellier, Doucet, Éclair, Garnier, Henry-Rivière, Jacquin, Levrard, Moulun, Pionnier, Raynaud, Rollandes, Trombe.

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Torpedo Flotilla.

On the 1st January, 1892, there will be built or completing the Torpedo Boats named below, whose dimensions and other particulars are given.

French Classification.	Number of Boats.	Name of the Type.	Length.	Breadth.	Extreme Draught of Water.	Displacement.	Horse-Power.	Speed.
			ft. in	ft. in.	ft. in.	tons.		knots.
Sea-going Torpedo Boats.	3	Coureur . .	149 3	14 5	5 5	114	1600	23·5
	7	Agile . .	143 0	14 9	8 3	104	1200	20·5
	5	Avant-Garde .	137 9	13 6	6 8	120	1500	20·5 to 21·0
	5	Ouragan . .	151 0	15 9	8 6	150	1600	20·5
	Total 20							
1st-class Torpedo Boats.	9	Balny . .	131 3	12 7	7 6	77	600	19·0
	21	No. 126 . .	118 0	13 2	8 6	80	900	21·0
	Total 30							
2nd-class Boats.	18*	No. 65 . .	108 3	12 10	6 10	50	500	20·0
	15	No. 130 . .	111 6	11 6	7 0	53	600	20·0
	50	No. 99 . .	115 0	11 0	6 7	55	525	19·0
	Total 83							

* Of these nine, which were built before 1884, are much worn and of little value.

Of what the French call 3rd-class Torpedo Boats there are now 41, which for the most part could only be used for training purposes. They are from 82 to 92 ft. in length, 10 ft. 6 in. to 11 ft. in breadth, of 30 to 35 tons displacement, and speed of 16 to 18 knots.

There are 6 boats called by the French Torpedo Vedette Boats, but which are what we call 2nd-class Torpedo Boats. They are from 60 to 66½ ft. long, 7 ft. 4½ in. broad, and have a displacement of from 10 to 22 tons and a speed of 17 knots.

They have also 14 Vedette Boats, which are from 33 to 40½ ft. in length, 6½ ft. to 7 ft. 9 in. broad, about 4 ft. draught of water, a displacement of from 4 to 7 tons, and speed of from 9 to 13 knots.

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GERMANY.—Armoured Ships.

a.g.b., armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *t.*, turret ship; *c.d.*, coast defence ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propellers.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt or Citadel.	Battery or Breastwork.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	knots.
br. c.d.	Arminius . . (iron)	1583	197 4	36 0	4½	7¼ turret	9	13 10	1	1200	4 21-c.m. 10-ton B.L.R. . . .	..	1864	92,512	10·50	200	..
b.	Baden . . . (iron)	7400	298 0	60 0	16	10 on barbette	8	19 8	2	5600	6 26-c.m. 18-ton Krupp B.L.R., 6 M., 4 l.	..	1880	444,886	14·00	700	..
a.g.b. c.d.	Basilisk . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1878	58,042	9·00	40	..
b.	Bayern . . (iron)	7400	298 0	60 0	16	10 barbette	8	19 8	2	5600	6 26-c.m. 18-ton Krupp B.L.R., 6 M., 4 l.	..	1878	406,660	14·00	700	..
a.g.b. c.d.	Biene . . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1876	62,853	9·00	40	..
,,	Camäleon . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1878	57,564	9·00	40	..
,,	Crocodil . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1879	57,237	9·00	40	..
c.b.	Deutschland . (iron)	7676	280 0	62 4	10	8	10	24 7	1	8000	8 26-c.m. 22-ton B.L.R., 1 21-c.m. 13-ton do., 2 15-c.m. 4-ton do., 6 M., 4 l.	5 f. tu. or l.car	1874	412,022	14·5	710	3400
,,	Friedrich Carl . (iron)	6007	300 0	54 6	5	4½	15	23 11	1	3500	16 21-c.m. B.L.R., 6 M., 4 l. . .	..	1867	322,663	13·60	672	1550
t.	Friedrich der Grosse . (iron)	6770	307 0	53 6	9¼	8 breastwork, 10 turret	8¼	24 7	1	4930	4 26-c.m. 18-ton Krupp B.L.R., 2 17-c.m. 6-ton do., 6 M., 4 l.	..	1874	365,170	14·00	550	2500
c.b.	Hansa . . .(wood)	3610	235 2	45 0	6	6 to 4½	12½	21 8	1	2442	8 21-c.m. 9-ton B.L.R., 6 M., 4 l.	..	1872	183,270	12·00	300	..
a.g.b. c.d.	Hummel . . (iron)	1109	143 0	35 6	8	8 turret	8	10 2	1	700	1 30½-c.m. 35-ton B.L.R., 2 M. . .	1 f. tu.	1881	56,741	9·00	40	..
c.b.	Kaiser . . . (iron)	7676	280 0	62 4	10	8	10	24 7	1	7803	8 26-c.m. 23-ton B.L.R., 7 15-c.m. 4-ton do., 6 M., 4 l.	5 f. tu. or l.car	1874	411,301	14·60	710	3400

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br.	**König Wilhelm**	(iron)	9567	355	0	60	0	8	7	10	26	7	1	8350	18 24-c.m. 14½-ton B.L.R., 4 21-c.m. 13-ton do., 6 15-c.m. 4-ton do., 6 M., 4 l.	..	1868	505,141	14·70	700	1740
b.	**A, B, C, and D**	(steel)	9842	354	4	64	0	15¾ to 11¾	11¾ barbette	2½ st.dk.	24	7	2	8000	6 28-c.m. B.L.R., 16 8·7-c.m. Q.F. .	..	Bldg.	..	16·0	..	..
c.b.	**Kronprinz** .	(iron)	5568	286	0	50	0	5	4½	16	24	3	1	4800	1 21-c.m. 12-ton B.L.R., 15 21-c.m. 9 ton do., 6 M., 4 l.	..	1867	314,836	14·30	650	..
a.g.b. c.d.	**Mücke** .	(iron)	1109	143	0	35	6	8	8 turret	8	10	2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. .	1 f. tu.	1877	60,960	9·00	40	..
,,	**Natter** .	(iron)	1109	143	0	35	6	8	8 turret	8	10	2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. .	1 f. tu.	1880	52,822	9·00	40	..
b.	**Oldenburg** .	(steel)	5200	246	0	59	0	13 (compound)	8 compound	..	19	6	2	3900	8 24-c.m. 18-ton Krupp B.L.R., 4 15-c.m. 4-ton do., 6 M., 4 l.	4 f. tu. or l. car	1884	235,342	13·5	250	..
t.	**Preussen** .	(iron)	6770	308	6	53	6	9	8 breastwork 10 turret	8	24	7	1	4383	4 26-c.m. 18-ton Krupp B.L.R., 2 17-c.m. do., 6 M., 4 l.	..	1873	351,904	14·00	550	2500
b.	**Sachsen** .	(iron)	7400	298	0	60	0	16	10 barbette	8	19	8	2	5600	6 26-c.m. 18-ton Krupp B.L.R., 6 M., 4 l.	..	1877	422,178	14·00	700	..
a.g.b. c.d.	**Salamander** .	(iron)	1109	143	0	35	6	8	8 turret	8	10	2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. .	1 f. tu.	1880	56,914	9·00	40	..
,,	**Scorpion** .	(iron)	1109	143	0	35	6	8	8 turret	8	10	2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. .	1 f. tu.	1877	60,796	9·00	40	..
a.c.	**Siegfried** .	(steel)	3495	240	0	49	3	9½	..	..	17	9	2	4800	3 24-c.m. 19-ton B.L.R. . . .	3 f. tu. or l. car	1889	175,000	18·0	..	..
,,	4 not named .	(steel)	3495	240	0	49	3	9½	..	..	17	9	..	4800	3 24-c.m. 19-ton B.L.R. . . .	3 f. tu. or l. car	Bldg.	175,000	16·0	..	..
a.g.b. c.d.	**Viper** .	(iron)	1109	143	0	35	6	8	8 turret	8	10	2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. .	1 f. tu.	1876	61,463	9·00	40	400 at 9 knots
,,	**Wespe** .	(iron)	1109	143	0	35	6	8	8 turret	8	10	2	2	700	1 30½-c.m. 35-ton B.L.R., 2 M. .	1 f. tu.	1876	53,771	9·0	40	360 at 9 knots
b.	**Wurttemberg**	(iron)	7400	298	0	60	0	16	10 barbette	8	19	8	2	5600	6 26-c.m. 18-ton Krupp B.L.R., 6 M., 4 l.	..	1878	402,512	14·00	700	..

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GERMANY.—Unarmoured Ships.

corv., corvette; *d.v.*, despatch vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.r.*, torpedo ram; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at ten knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Adler**	884	177 2	32 10	composite	11 6	1	724	2 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do.	..	1883	44,047	11·00	..	..
„	**Albatross**	716	168 0	26 10	wood	10 6	1	496	2 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do.	..	1871	38,092	10·00	..	..
corv.	**Alexandrine**	2373	236 3	42 7	iron, steel, and wood	18 4	1	2400	12 15-c.m. 4-ton B.L.R., 2 8·7 c.-m. 9-cwt. do., 4 M., 1 l.	1 f. tu. or l.car	1885	102,877	15·00	..	..
„	**Arcona**	2373	236 3	42 7	„	18 4	1	2400	12 15-c.m. 4-ton B.L.R., 2 8·7-c.m. 9-cwt. do., 4 M., 1 l.	1 f. tu. or l.car	1885	109,875	15·00	..	..
„	5 New ships P.	5500	328 0	49 3	steel	23 0	2	12,000	2 24-c.m. B.L.R., 8 15-c.m. do., Q.F.	..	Bldg. or to be built	..	20 0	..	..
	1 New ship P.	3500	..	..	..	..	..	..	.. .. ..	..	Bldg.	..	20·0	..	..
„	**Ariadne** (School ship)	1727	204 0	35 0	wood	17 4	1	2100	6 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do., 4 M., 1 l.	..	1871	91,979	13·00	..	..
fr. cr.	**Bismarck**	2856	244 4	44 10	iron and wood	19 8	1	2529	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l.	1 f. tu. or l.car	1877	136,055	13·00	..	..
d.v.	**Blitz**	1382	246 0	32 10	steel	13 5	2	2839	1 12½-c.m. 28-cwt. B.L.R., 4 8·7-c.m. 9-cwt. do., 4 M.	1 f. tu. or l.car	1882	66,935	16·00	..	..
fr.cr.	**Blucher***	2856	244 4	44 10	iron & wood	19 8	1	2990	16 15-c.m. B.L.R., 6 M., 2 l.	6 f. tu. or l.car	1877	136,408	14·00	..	..
to.r.	**Bremse** P.	866	203 5	27 10	steel	10 6	..	1500	1 21-c.m. 9-ton B.L.R.	..	1884	49,308	15·00	65	..
cr.	**Buzzard**	1580	256 0	..	„	..	2	2800	.. .. ..	..	1890	..	16·0	..	..
cr.	2 unnamed	1580	256 0	..	„	..	2	2800	.. .. ..	..	Bldg.	..	16·0	..	..
„	**Brummer** P.	866	203 5	27 10	„	10 6	..	1500	1 21-c.m. 9-ton B.L.R.	..	1884	52,422	15·00	65	..
corv.	**Carola**	2169	226 4	42 7	iron and wood	18 4	1	2340	8 15-c.m. 3½-ton B.L.R., 2 8·7-c.m. 9-cwt. do., 4 M., 1 l.	..	1880	109,617	14·00	..	2000
fr.cr.	**Charlotte**	3360	244 6	45 0	iron & wood	18 6	1	3000	18 15-c.m. 4-ton B.L.R., 6 M., 2 l.	1 f. tu. or l.car	1885	..	16·00	..	..
g.v.	**Eber**	570	152 6	26 3	composite	10 4	..	..	3 12½-c.m. 27-cwt. B.L.R.	..	1887	..	12·00	..	..

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corv.	**Freya**	2017	259	2	35	0	composite	17	4	1	2471	8 15-c.m. 3½-ton B.L.R., 4 M., 1 l. .	..	1874	106,868	15·0	..	..
„	**Germania** . . . . P.	4800	339	6	46	0	steel	..		2	8000	14 15-c.m. B.L.R., 8 M. . . .	f. tu. or l.car	Bldg.	220,000 without arm't	18·0	900	..
fr.cr.	**Gneisenau**	2856	244	4	44	10	iron and wood	19	8	1	2500	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l. .	1 f. tu. or l.car	1879	154,445	13·00	..	..
d.v.	**Greif**	2000	318	0	32	0	steel	13	0	2	5400	2 10½-c.m. 23-cwt. B.L.R., 10 M.. .	..	1886	..	19·00	..	..
„	**Grille**	350	170	6	24	3	wood	10	0	1	650	1 12½-c.m. 28-cwt. B.L.R., 2 8-c.m. do.	..	1857	..	13·00	..	..
g.v.	**Habicht**	848	174	0	29	6	composite	11	5	1	875	1 15-c.m. 3½-ton B.L.R., 4 12-c.m. 27-cwt. do., 4 8·7-c.m. do.	..	1879	33,054	12·00	..	..
„	**Hyäne**	489	139	8	25	1	iron	9	10	1	340	2 10½-c.m. B.L.R., 2 l. . . .	..	1878	24,340	9·00	..	..
„	**Iltis**	489	139	8	25	1	„	9	10	1	380	2 10½-c.m. B.L.R., 2 l. . . .	..	1878	27,480	9·00	..	..
cr.	**Irene** . . . . P.	4300	339	6	46	0	steel	21	0	2	8000	14 15-c.m. B.L.R., 8 M. . . .	4 f. tu. or l.car	1887	220,000 without arm't	18·0	900	..
d.v.	**Jagd**	1240	275	6	31	6	„	13	9	2	4000	3 10½-c.m. 23-cwt. B.L.R., 10 M.. .	..	1888	..	19·0	..	..
fr.cr.	**Leipzig**	3925	282	2	45	8	iron and wood	21	7	1	3590	2 17-c.m. 5½-ton B.L.R., 10 17-c.m. 3½-ton. 6 M., 2 l.	..	1875	203,055	14·00	..	4000
corv.	**Luise** (School ship) . .	1719	204	0	35	0	wood	17	4	1	2100	6 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do., 4 M., 1 l.	..	1872	85,975	13·00	..	..
„	**Marie**	2169	226	4	42	7	iron & wood	18	4	1	2257	8 15-c.m. 3½-ton B.L.R., 2 8·7-c.m. 9-cwt. do., 4 M., 1 l.	1 f. tu. or l.car	1881	..	13·50	..	2000
d.v.	**Meteor**	780	262	6	29	6	steel	11	6	2	5000	4 8-c.m. B.L.R., 7 Q.F., 2 M. . .	..	1890	..	23·0	..	..
fr.cr.	**Moltke**	2856	244	4	44	10	„	19	8	1	2500	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l. .	1 f. tu. or l.car	1877	140,705	13·50	..	..
to. g.b.	1 New ship	800	..		..		„	..		2	..	.. .. ..	..	Bldg.	..	22·0	..	..
g.v.	**Möwe**	848	174	0	29	6	composite	11	5	1	784	1 15-c.m. 3½-ton B.L.R., 4 12-c.m. 27-cwt. do., 4 8·7-c.m. 9-cwt. do.	..	1879	33,390	12·00	..	..
„	**Nautilus**	716	168	0	26	10	wood	10	6	1	496	2 15-c.m. 3½-ton B.L.R., 2 12-c.m. 27-cwt. do.	..	1871	38,147	10·00	..	..
corv.	**Olga**	2169	226	4	42	7	iron & wood (sheathed)	18	4	1	2397	8 15-c.m. 3½-ton B.L.R., 2 8·7-c.m. 9-cwt. do., 4 M., 1 l.	..	1880	113,812	14·00	..	2000
d.v.	**Pfeil**	1382	246	0	32	10	steel	13	5	2	2700	1 12½-c.m. 28-cwt. B.L.R., 4 8·7-c.m. 9-cwt. do., 4 M.	1 f. tu.	1882	73,605	15·00	..	..
cr.	**Prinzess Wilhelm** . P.	4300	339	6	46	0	„	..		2	8000	14 15-c.m. B.L.R.	1 f. tu. 11 car.	1887	220,000 without arm't	18·0	900	..
fr.cr.	**Prinz Adalbert** . . .	3925	282	2	45	8	iron & wood	21	7	1	3612	2 17-c.m. 5½-ton B.L.R., 10 17-c.m. 3½-ton do., 6 M., 2 l.	..	1876	206,499	15.00	..	..

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GERMANY.—Unarmoured Ships—*continued.*

corv., corvette; *d.v.*, despatch vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.r.*, torpedo ram; *to.g.b.*, torpedo gunboat; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	Schwalbe	1300	203 0	30 6	composite	12 4	2	1500	8 10½-c.m. 22½-cwt. B.L.R. Krupp, 4 M.	..	1887	..	13·50	..	..
corv.	Sophie	2169	226 4	42 7	iron & wood	18 4	1	2100	8 15-c.m. 3½-ton B.L.R., 2 8·7-c.m. 9 cwt. do., 4 M., 1 l.	..	1881	117,155	14·00	..	2000
g.v.	Sperber	1300	236 0	29 8	composite	12 6	2	1500	8 10½-c.m. 22½-cwt. B.L.R., 4 M.	..	1888	..	13·5	..	..
fr.cr.	Stein	2856	244 4	44 10	„	19 8	1	2707	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l.	1 f. tu. or l.car	1879	136,069	14·00	..	..
„	Stosch	2856	244 4	44 10	„	19 8	1	2581	16 15-c.m. 3½-ton B.L.R., 6 M., 2 l.	1 f. tu. or l.car	1877	126,066	13·00	..	..
corv.	Victoria	1825	235 9	35 4	wood	17 8	1	1300	4 15-c.m. 3½-ton B.L.R., 6 12-c.m. 27-cwt. do., 4 M., 1 l.	..	1864	84,450	13·00	..	..
d.v.	Wacht	1240	275 6	31 6	steel	13 9	2	4000	3 10½-c.m. 23 cwt. B.L.R., 10 M.	..	1887	..	20·0	..	..
g.v.	Wolf	489	139 8	25 1	iron	9 10	1	340	2 10½-c.m. 23-cwt. B.L.R., 2 l.	..	1878	24,343	9·00	..	..
d.v.	Zieten	975	196 10	29 6	„	11 6	1	2323	4 12-c.m. 27-cwt. B.L.R., 4 M.	..	1876	81,755	16·00	140	..
to. g.b.	2 Torpedo Gun Boats (1 under-water torpedo discharge)	380	..	..	steel	..	2	..	6 Q.F.	3 l. car.	Bldg.	..	26·0	..	..
	2 Torpedo Gunboats	350	..	..	„	..	2	4000	6 Q.F.	3 l. car.	1890	..	26·00	..	..
	2 Torpedo Gunboats	320	190 0	23 0	„	9 6	2	..	6 M.	3 l. car.	1889	..	22·0	..	..

There are, also, on the German list, besides stationary, surveying, harbour vessels and yachts, the following:—

One steam gunnery ship.—Mars of 3333 tons displacement, and 2000 I.HP.

Two steam gunnery tenders.

One steam torpedo tender (Ulan).

One steam gunboat (Dracke).

One steam training ship—Nixe.

Eight small torpedo vessels; 50 to 140 tons, 500 to 550 I.HP.

Torpedo Boats.

Ninety-four first-class, of 65 to 85 tons and 9 to 22 knots speed, armament, 2 launching tubes; 2 machine guns, 13 second-class boats.

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GREECE.—Armoured Ships.

t., turret ship; *br.*, broadside ship; *c.b.*, central-battery ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Mean Draught of Water.	Propeller.	Indicated Horse power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	
t.	**Hydra** . (steel)	4885	320 0	51 10	11¾	13¾	..	18 0	2	6700	3 27-c.m. B.L.R., 5 15-c m. do., 7 6-pdr. Q.F., 16 M., 2 l.	3 l. car	1889	..	17·00	..	..
c.b.	**King George** (iron)	1774	200 2	32 10	7	6	..	15 6	2	2400	2 21-c.m. 10-ton B.L.R. (Krupp), 2 M., 4 l. .	..	1867	..	12·00	210	..
br.	**Olga** . (wood)	2060	230 0	59 0	4¾	4	..	18 0	1	1950	4 17-c.m. 5½-ton B.L.R. (long Krupp), 2 17-c.m. 3½-ton do. (short), 2 M., 4 l.	..	1869	..	10·00	240	..
t.	**Psara** . .	4885	320 0	51 10	11¾	13¾	..	18 0	2	6700	3 27-c.m. B.L.R., 5 15-c.m. do., 7 6-pdr. Q.F., 16 M.	3 l. car	1890	..	17·0	..	..
t.	**Spetsia** . .	4885	320 0	51 10	11¾	13¾	..	18 0	2	6700	2 27-c.m. B.L.R., 5 15-c.m. do., 7 6-pdr. Q.F., 16 M., 2 l.	3 l. car	1889	..	17·0	..	..

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GREECE.—Unarmoured Ships.

cr., cruiser; *corv.*, corvette; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	
g.v.	**Acheloos** . . .	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
corv.	**Admiral Miaulis** .	1800	246 0	36 0	iron and wood	14 5	1	2200	3 17-c.m. B.L.R. 5½-ton (long Krupp), 1 17-c.m. 3½-ton do. (short), 2 M., 4 l.	..	1879	..	15·00	220	..
g.v.	**Alpheos** . . .	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
„	**Aphroessa** . .	380	124 7	22 11	iron	9 10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	1858	..	9·00	30	..
„	**Eurotas** . . .	420	138 0	24 11	steel	11 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·00	50	..
fr.cr.	**Hellas**	1300	200 2	37 0	wood	19 4	1	1500	12 15-c.m. B.L.R. (Krupp), 2 M. . .	..	1878 (repaired)	..	11·00	230	..
g.v.	**Hydra**	440	124 8	29 6	steel & wood	9 6	2	380	1 26-c.m. 26-ton B.L.R. (Krupp), 2 M. .	..	1881	..	10.00	60	..
cr.	**Mecali** (was Buzzard) .	1000	210 6	32 6	steel	..	2	1000	.. ..	..	1880	..	..	..	..
g.v.	**Nauplion** . . .	380	124 7	22 11	iron	9 10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	1856	..	9·00	30	..
„	**Paralos** . . .	380	123 0	23 11	„	9 10	1	204	1 8·7-c.m. B.L.R. (Krupp), 1 M. . .	..	1858	..	8·00	60	..
„	**Peneus**	420	138 0	24 11	steel	12 6	1	400	2 9·6-c.m. B.L.R. (Krupp), 3 M. . .	..	1884	..	10·55	50	..
„	**Plixiavra** . . .	380	124 7	22 11	iron	9 10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	1856	..	9·00	55	..
cr.	**Salamina** . . .	380	123 0	23 11	„	9 10	1	200	1 8·7-c.m. B.L.R. (Krupp), 1 M. . .	..	1858	..	8·00	60	..
„	**Sfaktirea** (was Eldorado)	1000	235 0	30 0	steel	13 0	1	1700	.. ..	..	1885	..	14·50	100	..
g.v.	**Spetsai**	440	124 8	29 6	steel & wood	9 6	2	680	1 26-c.m. 26-ton B.L.R. (Krupp), 2 M. .	..	1881	..	11·30	50	..
„	**Syros**	380	124 7	22 11	iron	9 10	1	160	1 8·7-c.m. B.L.R. (Krupp) . . .	..	..	..	9·00	18	..

Torpedo depôt ship.—Psara, 1100 tons, 500 IH.P., 2 10-c.m. B.L.R. (Krupp) guns, 2 Whitehead torpedo-launching guns, one port on each broadside, 2 under-water torpedo tubes ahead. 14 knots speed.

Torpedo boats.—32 of several classes, 6 being sea-going, of 128 ft. long, 15 ft. 3 in. broad, of 85 tons displacement, 1000 horse-power, and 19 knots speed, built at Stettin; and 6 other first class boats, built by Yarrow, of about 100 ft. in length, of 46 tons displacement, and 620 horse-power and 20 knots speed; 19 of 21 to 35 tons displacement, and 20 smaller steam-boats for torpedo purposes.

There are also 2 gunboats of the Lambda (China) class, of 440 tons displacement, 380 horse-power, 10 knot speed, fitted with 1 26-c.m. Krupp gun and 2 machine guns; four small iron steamers fitted for spar torpedoes; and five small composite custom-house steamers; also a paddle yacht and a screw transport—the Bosbulina—of 1170 tons displacement, and 1800 horse-power.

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HAYTI.

(The Republic of Hayti has unarmoured ships only.) *corv.*, corvette; *g.v.*, gun-vessel; *sl.*, sloop.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean draught of water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	22nd December .	900	208 0	29 11	iron	16 0	1	360	4 40-pdr. (Armstrong)	..	1860	..	9·00	..	..
corv.	Dessalines . .	..	185 0	32 0	„	14 9	1	190 (nominal)	1 7-in., 2 30-pdr., 4 24-pdr. . . .	..	1883	..	16·00	..	..
sl.	St. Michael. .	850	162 0	33 0	„	11 0	1	120 (nominal)	1 11-in. smoothbore, 8 30-pdr. . .	..	1875	..	12·00	..	..
„	1804 . . .	600	145 0	29 0	„	10 0	1	100 (nominal)	1 10-in. smoothbore, 6 30-pdr. . .	..	1875	..	12·00	..	..
„	Toussaint L'ouverture	500	164 0	24 6	steel	9 6	1	800	1 6½-in. B.L.R., 2 4¾-in. do., 2 M.	..	1886	..	12·00	120	3000

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ITALY.—Armoured Ships.

a.g.b., armoured gunboat; *b.*, barbette ship; *c.b.*, central-battery ship; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Citadel or Turret.					Guns.	White-head Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	ins	ft. in.						£	knots.	tons.	knots.
t.	Affondatore . .(iron)	4376	290 0	40 0	5	5 turret	9	20 0	1	3240	2 25-c.m. 28-ton B.L.R. (Armstrong), 4 12-c.m. do., 6 M.	4 l. car.	1865	152,480	12·00	460	1647
c.b.	Ancona . . .(iron)	4250	256 0	50 0	4½	4½	13¾	25 0	1	2548	6 15-c.m. B.L.R., 6 12-c.m. do. 6 M. .	2 l. car.	1864	172,000	11·2	485	2000
b.	Andrea Doria (steel)	11,000	328 2	65 4	18 comp.	18 comp.	..	27 2	2	10,000	4 43-c.m. 105-ton B.L.R. (Armstrong), 2 15-c.m. do., 4 12-c.m. do., 12 M.	5 f. tu. or l. car (2 sub)	1885	..	16·00	850	4500
c.b.	Castelfidardo . .(iron)	4250	256 0	50 0	4½	4½	13¾	21 11	1	2125	8 15-c.m. B.L.R., 6 12-c.m. do., 6 20-c.m. 7-ton do., 6 M.	2 l. car.	1863	..	12·00	485	2600
t.	Dandolo . (iron and steel)	11,202	340 11	64 9	21½	18 turret	22¾	26 7	2	7500	4 45-c.m. 100-ton M.L.R. (Armstrong), 3 12-c.m. B.L.R., 12 M., 2 l.	3 f. tu. or l. car	1878	700,000	15·60	1000	3760
„	Duilio . (iron and steel)	11,138	340 11	64 9	21½	18 turret	22¾	26 7	2	7500	4 45-c.m. 100-ton M.L.R. (Armstrong), 3 12-c.m. B.L.R., 12 M., 2 l.	3 f. tu. or l. car	1876	..	15·00	1000	3760
c.b.	Formidabile . .(iron)	2725	216 0	45 10	4½	4½ battery	9	18 0	1	1100	4 20-c.m. 7-ton M.L.R. (Armstrong), 2 15-c.m. B.L.R., 5 12-c.m. do., 4 M.	..	1861	118,000	11·00	310	..
b.	Francesco Morosini (steel)	11,000	328 2	65 4	18 comp.	18 comp.	..	27 2	2	10,000	4 43-c.m. 105-ton B.L.R. (Armstrong), 2 15-c.m. do., do. 14 M.	5 f. tu. or l. car (2 sub)	1885	..	16·00	850	4500
„	Italia . . (steel)	13,851	400 6	74 0	16-inch funnel op'nings	19 comp.	22¾	31 2	2	18,000	4 43-c.m. 100-ton B.L.R. (Armstrong), 8 15-c.m. 4-ton do., 14 M.	4 f. tu. or l. car	1880	..	18·00	1650	8900

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„	**Lepanto** .	(steel)	13,550	400	6	74	0	16-inch funnel op'nings	19 comp.	22¾	31	2	2	18,000	4 43-c.m. 100-ton B.L.R. (Armstrong), 8 15-c.m. 4-ton do., 14 M., 4 l.	4 f. tu. or l. car	1883	..	18·38	1650	900
c.b.	**Maria Pia** . .	(iron)	4268	256	0	49	4	4½	4½	13¾	22	7	1	2924	8 15-c.m. B.L.R., 6 12-c.m. do. . .	2 f. tu. or l. car	1863	..	12·00	485	2600
2 batteries	**Palestro** . .	(wood)	6419	265	0	57	10	8¾	6	24	26	11	1	3496	1 28-c.m. 25-ton M.L.R. (Armstrong), 6 25-c.m. 18-ton do., 6 M., 6 l.	2 f. tu. or l. car	1873	..	13·00	513	1780
„	**Principe Amedeo**	(wood)	5814	265	0	57	9	8¾	6	24	26	6	1	3413	1 28-c.m. 25-ton M.L.R. (Armstrong), 6 25-c.m. 18-ton do., 6 M., 6 l.	2 f. tu. or l. car	1872	..	13·00	513	1780
b.	**Re Umberto**	(steel)	13,251	400	0	76	9	..	18 barbettes	..	28	6	2	19,500	4 34-c.m. 67-ton B.L.R. (Armstrong), 8 15-c.m. do., 16 12-c.m. do., 10 Q.F. and M.	6 f. tu. or l. car	1888	1,000,000	18·00	1200	..
c.b.	**Roma** . .	(wood)	5814	262	6	58	6	4½	4½ battery	26	25	3	1	3000	9 22-c.m. 13-ton M.L.R., (Armstrong), 6 M., 6 l.	2 l. car.	1865	..	13·00	511	1940
b.	**Ruggiero di Lauria** .	(steel)	11,000	328	2	65	4	18 comp.	18 comp. barbettes	..	27	2	2	10,000	4 43-c.m. 105-ton B.L.R. (Armstrong), 2 15-c.m. do., 4 12 c.m. do., 12 M.	5 f. tu. or l. car (2 sub)	1884	..	17·5	850	4500
c.b.	**San Martino** . .	(iron)	4268	256	0	49	4	4½	4½	14	22	7	1	2620	8 15-c.m. B.L.R., 6 12-c.m. do., 6 M. .	2 f. tu. or l. car	1863	..	12·00	490	..
b.	**Sardegna** .	(steel)	13,251	400	0	76	9	..	18 comp. barbettes	..	28	6	2	22,800	4 34-c.m. 67-ton B.L.R. (Armstrong), 8 15-c.m. do., 6 12-c.m. do., 10 Q.F. and M.	7 f. tu. or l. car	1890	1,000,000	19·00	1200	..
„	**Sicilia** . .	(steel)	13,251	400	0	76	9	..	18 comp. barbettes	..	28	6	2	19,500	4 34-c.m. 67-ton B.L.R. (Armstrong), 8 15-c.m. do., 16 12-c.m. do., 10 Q.F. and M.	7 f. tu. or l. car	Bldg.	1,000,000	18·00	1200	..
„	C—New ship (not named) . (Similar to the Sicilia).		14,000	..	..	..	..	..	..	..	..	..	..	..	.. ..	..	To be laid down	..	..	..	..
c.b.	**Terribile** . .	(iron)	2725	210	0	45	11	4½	4½ battery	9	18	0	1	1100	8 20-c.m. 7-ton M.L.R. (Armstrong), 4 m., 6 l.	..	1861	112,454	11·00	310	..
„	**Varese** . .	(iron)	2220	200	0	42	7	4½	4½ battery	9	15	9	2	977	4 20-c.m. 7-ton M.L.R. (Armstrong), 1 16-c.m. M.L.R., 4 M., 6 l.	..	1865	85,000	10·00	180	..

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ITALY.—Unarmoured Ships.

corv., corvette; *d.v.*, despatch vessel; *g.v.*, gun-vessel; *fr.cr.*, frigate-built cruiser; *to.g.b.*, torpedo gun boat; *to.cr.*, torpedo cruiser; *to.r.cr.*, torpedo-ram cruiser; *to.s.*, torpedo ship; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armaments.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
d.v.	Agostino Barbarigo	656	216 6	23 11	steel	10 10	1	1700	5 57-m.m. Q.F., 2 M.	..	1879	..	15·50	210	1000
cr.	Amerigo Vespucci . P.	2533	255 11	42 7	„	17 0	1	5000	8 15-c.m. 4-ton B.L.R., 6 M., 3 l.	2 l. car.	1882	..	15·00	500	..
g.v.	Andrea Provana	649	167 4	26 3	„	10 2	1	1000	4 12-c.m. B.L.R., 2 M.	..	1884	..	13·00	120	..
d.v.	Archimede	770	230 0	26 3	„	10 0	1	1700	4 12-c.m. B.L.R., 4 M.	2 l. car	1887	..	16·00	210	..
to.cr.	Aretusa	740	230 0	25 6	„	11 9	3	4200	4 6-pdr. and 2 3-pdr. Q.F., 3 M.	5 f. tu. or l.car	Bldg.	..	20	180	..
corv.	Caracciolo (Training ship)	1650	209 11	36 0	wood	16 5	1	973	6 16-c.m. 5-ton M.L.R., 4 M.	..	1869	..	10·00	180	..
g.v.	Cariddi	1050	177 2	28 6	„	12 5	1	956	1 16-c.m., 2 12-c.m. B.L.R., 4 M.	..	1875	..	10·00	164	..
„	Castore	530	116 0	36 0	steel	9 6	1	..	1 12-c.m. Krupp	..	1889	..	8	..	..
to.cr.	Confienza	740	230 0	25 6	steel	9 0	3	3600	1 12 c.m. B.L.R., 4 6-pdr., and 2 3-pr. Q.F.G., 3 M.	2 f. tu. or l.car	1887	..	20·00	180	..
corv.	Cristoforo Colombo	2362	249 4	36 0	wood	17 4	1	3782	8 12-c.m. B.L.R., 4 M.	..	1875	..	14·00	471	3600
g.v.	Curtatone	1040	177 3	32 8	steel	13 6	1	1100	6 5-inch B.L.R.	..	1887	..	12·00	197	..
cr.	Dogali P.	2020	250 0	37 0	„	14 6	2	7600	6 6-inch B.L.R. (Armstrong), 9 Q.F., 6 M.	3 l. car	1887	170,000	19·66	480	..
cr.	Elba P.	2280	262 6	39 6	„	16 7	2	6500	6 6-inch 5-ton B.L.R., 4 47-inch do.	..	Bldg.	..	..	..	..
tor.cr.	Etna P.	3530	282 2	42 7	steel	19 0	2	6000	2 25-c.m. 28-ton B.L.R. (Armstrong), 6 15-c.m. 4-ton do., 6 Q.F., 2 M.	4 f. tu. or l.car	1885	64,000 (engines)	17·00	630	..
tor.cr.	Three new ships, Etna class P.	..	..	..	„	..	..	..	..	..	To be laid down	..	..	..	..
tor.cr.	Euridice	840	229 6	26 9	steel	10 2	2	4000	1 47-inch Q.F., 6 6-inch do., 2 M.	5 f. tu. or l.car	Bldg.	..	21·0	120	..
c.r.	Etruria P.	2280	262 6	39 6	„	16 7	2	6500	6 6-in. 5-ton B.L.R., 4 7-in. do.	..	Bldg.	..	18·50	400	..
d.v.	Faadi Bruno	840	137 6	32 9	„	..	1	800	..	..	Bldg.	..	20·0	..	..
cr.	Fieramosca P.	3745	290 0	43 6	„	19 4	2	7700	2 25-c.m. 25-ton B.L.R., 6 6-inch 4-ton B.L.R.	4 f. tu. or l.car	1888	..	17·00	590	..
corv.	Flavio Gioja P.	2533	255 11	42 7	„	17 0	1	5000	8 15-c.m. 4-ton B.L.R. (Armstrong), 6 M.	3 f. tu. or l.car	1881	..	15·00	500	..
to.g.b.	Folgore	317	187 0	19 8	„	6 7	2	2400	2 6-pr. and 2 3-pr. Q.F., 1 M.	3 l.car.	1886	..	20·00	60	..

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d.v.	**Galileo**		770	230	0	26	3	„	8	2	1	1700	4 5-inch B.L.R., 4 M.	2 l. car	1887	..	15·00	210	..
fr.cr.	**Garibaldi (Hospital ship)**		3376	223	2	49	3	wood	20	11	1	1041	8 16-c.m. M.L.R., 4 M. (as war vessel)	..	1860	..	9·00	330	..
cr.	**Giovanni Bausan**	P.	3068	275	7	42	7	steel	18	4	2	6500	2 25-c.m. 24-ton B.L.R. (Armstrong), 6 15-c.m. 5-ton B.L.R., 4 M.	3 f. tu. or l.car (1 f. tu. sub.)	1883	160,000	17·00	600	5000
to.cr.	**Goito**		740	230	0	25	6	„	11	9	2	4200	4 6-pr. and 2 3-pr. Q.F., 3 M.	6 f. tu. or l.car	1887	..	20·00	180	..
to.cr.	**Iride**		840	229	6	26	9	„	10	2	2	4000	1 4·7-in. Q.F., 6 6-pdr. do. 2 M.	5 l. car.	Bldg.	..	21·00	120	..
cr.	**Liguria**	P.	2280	262	6	39	6	„	16	7	2	6500	6 6-in. 5-ton B.L.R., 4 4·7-in. do.	..	Bldg.	..	20·00	..	..
„	**Lombardia**	P.	2280	262	6	39	6	„	16	7	2	6500	6 6-in. 5-ton B.L.R., 4 4·7-in. do.	..	Bldg.	..	20·00	..	..
d.v.	**Marcantonio Colonna**		656	216	6	23	11	„	10	10	1	1700	5 57-m.m. Q.F., 2 M.	..	1879	..	15·40	197	..
cr.	**Marco Polo**	P.	3500	283	0	43	0	„	19	0	2	7700	2 10-in. 28-ton B.L.R., 4 6-in. 4-ton do., 8 Q.F.	..	Bldg.	..	17·00	..	..
to.cr.	**Minerva**		740	230	0	25	6	„	11	9	3	4200	6 6-pr. and 2 3-in. Q.F., 3 M.	5 f. tu. or l.car	Bldg.	..	20·00	180	..
„	**Montebello**		740	230	0	25	6	„	11	9	3	4200	6 6-pr. Q.F.G., 2 3-pr. do., 3 M.	5 f. tu. or l.car	1888	..	20·00	180	..
„	**Monzambano**		740	230	0	25	6	„	11	9	3	4200	6 6-pr. and 2 3-pr. Q.F., 3 M.	5 f. tu. or l.car	1888	..	20·00	180	..
„	**Partenope**		840	246	0	25	6	„	11	9	3	4200	6 6-pr. and 2 3-pr. Q.F., 3 M.	5 f. tu. or l.car	Bldg.	..	20·00	180	..
cr.	**Piemonte**	P	2500	300	0	38	0	„	15	0	2	12,000	6 6-inch Q.F., 6 4¾-inch do., 10 6-pdr. do., 10 M. (4 being maxims)	3 f. tu.	1888	..	21·00	600	13,000
to.s.	**Pietro Micca**		535	203	5	19	7	iron	10	6	1	972	2 M.	1 l. car.	1876	..	10·00	28	..
g.v.	**Poluce**		530	116	0	36	0	„	9	6	1	..	1 12-c.m. Krupp	..	1889	..	8·0	..	..
d.v.	**Rapido**		1568	262	5	30	6	„	12	6	1	1920	5 57-m.m. Q.F., 2 M.	..	1876	..	13·40	300	2560
to.g.b.	**Saetta**		317	187	0	19	8	steel	6	7	1	2400	2 6-pr. Q.F., 2 3-pr. do., 2 M.	..	1887	..	20·00	90	..
cr.	**Savoia**	P.	2850	275	6	42	7	„	17	0	1	5000	6 6-pr. Q.F., 4 M.	..	1883	..	15·00	500	..
g.v.	**Scilla**		1050	177	2	28	6	wood	12	5	1	826	2 12-c.m. B.L.R. (Armstrong), 1 16-c.m., 4 M.	..	1874	..	10·00	..	..
„	**Sebastiano Veniero**		649	167	4	26	3	steel	10	2	1	1000	4 12-c.m. B.L.R., 2 M.	..	1884	..	13·00	..	..
d.v.	**Stafetta**		1505	252	7	30	10	iron	13	2	1	1800	4 12-c.m. B.L.R., 2 M.	1 l. car.	1876	..	13·50	300	3300
to.cr.	**Stromboli**	P.	3530	282	2	42	7	steel	19	0	2	7700	2 25-c.m. 28-ton B.L.R. (Armstrong), 6 15-c.m. 4-ton do., 8 M.	4 f. tu. or l.car	1886	64,000 (Engines)	17·00	630	..
to.cr.	**Tripoli**		740	230	0	25	10	„	11	9	2	4200	4 6-pr. and 2 3-pr. Q.F., 3 M.	5 f. tu. or l.car	1886	..	20·00	180	..

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ITALY.—Unarmoured Ships.—*continued.*

corv., corvette; *d.v.*, despatch vessel; *g.v.*, gun-vessel; *fr.cr.*, frigate-built cruiser; *to.g.b.*, torpedo gunboat; *to.cr.*, torpedo cruiser; *to.r.cr.*, torpedo-ram cruiser; *to.s.*, torpedo ship; P., deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armaments. Guns.	Armaments. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr.	**Umbria** . . . P.	2280	262 6	39 6	steel	16 7	2	6500	6 6-in. 5-ton B.L.R., 4 4·7-in. do. .	..	Bldg.	...	20·00	..	..
„	**Urania**	740	230 0	25 6	„	11 9	3	4200	4 6-in. and 4 3-in. Q.F., 3 M. . .	5 f. tu. or l.car	Bldg.	...	20·00	180	...
d.v.	**Vedetta**	827	183 9	26 11	iron	11 5	1	670	4 12-c.m. B.L.R., 6 M. . . .	..	1866	..	11·00	137	..
g.v.	**Veniero**	649	170 0	26 3	steel	10 6	..	1068	4 12-c.m. B.L.R., 2 M.	..	1889	...	13·00	..	..
tor.cr.	**Vesuvio** . . . P.	3530	282 2	42 7	steel	19 0	2	7700	2 25-c.m. 28-ton B.L.R. (Armstrong), 6 15-c.m. 4-ton B.L.R. 8 Q.F. and M., 2 l.	4 f. tu. or l.car	1886	64,000 (Engines)	17·00	590	.. ..
fr.cr.	**Vettor Pisani** (Training ship)	1800	213 3	39 4	wood	17 0	1	1004	6 12-c.m. B.L.R., 4 M. . . .	..	1869	..	9·00	190	..
g.v.	**Volturno**	1040	177 3	32 8	steel	13 6	1	1100	6 5-inch B.L.R.	..	1887	..	12·00	197	..

Besides the ships of which the names are given in the foregoing tables, Italy has

Gunboats (*Staunch class*).—Guardiano and Sentinella, of 265 tons, and of 231 and 260 I.HP. respectively; 6 small gunboats of 87 tons and 52 HP.; Castore and Poluca, of 530 tons, and 8 knots speed.

Paddle despatch vessels.—Esploratore, Messaggiero, of 1000 to 1200 tons, and 12 to 15 knots speed.

Also transports; one being the Eritreo (late the America), of 9550 tons displacement, and 18 knots speed; torpedo depôt ship Vulcano; surveying vessel, training ships, Maria Adelaide, of 3429 tons, and the Vittoria Emanuele of 3076 tons, harbour and coasting-service craft, &c.

Torpedo boats.—First class, 100 built and building; of these five of the Nibbio class are 152½ ft. long, 16 ft. 9 inches wide, about 140 tons displacement, and 23 knots speed; nine are 135 ft. long, 14 ft. wide, displacement 110 tons, and 22·5 knots speed; 84 of 100 to 130 ft. long, and of 85 tons to 32 tons displacement, and 20 to 22½ knots speed; and the two others from 80 to 100 ft. long, of 32 tons displacement, and 21 knots speed; second class 22, all built of steel, displacement 13 to 31 tons, and with speeds from 16 to 21 knots.

Torpedo boats, wood. There are eight built or building of from 50 to 60 ft. long, of 11 tons displacement, and 16·5 knots speed.

There are nine merchant steamers of more than 3000 tons on the auxiliary list, viz., China, Manilla, Orione, Perses, Raffaele, Rubattino, Singapore, Siris, and Washington. Of these, three are fitted for two torpedo-launching apparatus.

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JAPAN.—Armoured Ships.

a.c., armoured cruiser; *a.g.b.*, armoured gunboat; *br.*, broadside ship; *c.b.*, central-battery ship; f. tu., l. car., fixed tube or launching carriage for discharging Whitehead torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
Ram	**Adsuma** . . (iron) (was Stonewall Jackson)	1380	157 5	30 0	4	4	..	13 3	2	700	1 9-in. 13-ton M.L.R. (Armstrong), 4 6½-in. 5-ton do.	..	1864	..	9·00	..	..
c.b.	**Fu-Soo** . . . (iron)	3718	220 0	48 0	7	9	..	18 4	2	3500	4 24-c.m. 15-ton B.L.R. (Krupp), 2 17-c.m. 6-ton do., 6 l., 5 M.	..	1877	..	13·2	360	4500
a.c.	**Hi-yei** *. . (composite)	2200	231 0	40 9	4½	..	..	17 4	1	2490	3 17-c.m. 3½-ton B.L.R. (Krupp), 6 15-c.m. do.	..	1878	..	13·00	280	..
„	**Kin-go** * . (composite)	2200	231 0	40 9	4½	..	..	17 4	1	2450	3 17-c.m. 3½-ton B.L.R. (Krupp), 6 15-c.m. do.	..	1877	..	13·70	280	..
br.	**Rio-jo** . . (composite)	1459	213 3	34 5	4½	4	..	17 4	1	975	2 17-c.m. 6-ton B.L.R. (Krupp), 6 70-pdr. (Vavasseur).	..	1864	..	9·00	350	..
a.g.b.	**Tisima**	1480	..	..	..	..	..	..	..	..	.. .. ..	..	1888	..	..	..	..
a.c.	**Tschiyoda** . . (steel)	2450	308 0	42 6	4½	..	..	14 0	2	5600	10 12-c.m. Q.F., 14 4·7-c.m. do., 3 M.	3 l. car.	1889	..	19·0	240	..

* These are not armoured ships in the usual sense of the term. There is no armour as against end-on fire, and no armoured deck.

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JAPAN.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *c.d.s.*, coast defence ships; *d.v.*, despatch vessel; *g.v.*, gun-vessel; P., deck protected throughout; *pp.*, deck protected amidships only; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.							knots.	tons.	knots.
g.v.	**Akagi**	615	164 0	27 0	steel	10 0	..	700	1 24-c.m. B.L.R (Krupp), 1 12-c.m. do., 2 M.	..	1888	..	12·00	..	..
cr.	**Akitsuschima** (Medea type)	..	..	..	..	..	..	..	.. ..	..	Bldg.	..	..	..	..
cr.	**Akutsima** (Medea type) .	..	..	..	..	..	..	..	.. ..	..	1890	..	..	..	..
d.v.	**Amaki**	908	200 0	29 6	wood	13 9	1	720	1 15-c.m. B.L.R. (Krupp), 4 12-c.m. do. .	..	1877	..	11·00	150	..
corv.	**Asama** (training ship) .	1104	206 9	33 9	„	10 10	1	300 (nom.)	8 17-c.m. B.L.R. (Krupp), 4 4½-in. do. (Armstrong), 4 l.	..	..	..	..	..	..
g.v.	**Atago**	615	164 0	27 0	steel	10 0	..	700	1 24-c.m. B.L.R. (Krupp), 1 12-c.m. do., 2 M.	..	1887	..	12·00	..	..
„	**Banjo**	595	154 0	25 0	wood	12 0	1	590	1 6-inch B.L.R., 1 4¾-inch do. . . .	..	1879	..	10·00	107	..
cr.	**Chiyota**	2450	260 0	42 0	steel	13 9	2	5400	1 12½-in. 45-ton B.L.R., 11 4¾-in. do., 18 M.	..	1890	..	19·00	..	850·0
corv.	**Fuziyama** (training ship) .	1000	203 0	36 0	..	11 0	1	180 (n)	2 15-c.m. Krupp, 1·6-inch Armstrong, 10 L.	..	1865	..	13·0	..	..
d.v.	**Gwaki**	600	146 4	25 3	wood	12 2	1	650	1 15-c.m. B.L.R. (Krupp), 2 12-c.m. do. .	..	1888	..	10·00	..	..
c.d.s.	**Hasidate** . . .	4277	325 0	50 10	steel	21 2	2	5400	10 12-c.m. Q.F. & M.	..	1890	..	19·0	..	850·0
g.v.	**Ho Sho**	470	120 0	24 0	„	9 6	1	240	2 M.L.R., 2 B.L.R.	..	1868	..	11·00	50	..
c.d.s.	**Itsukusima** . . P.	4277	325 0	50 10	..	21 2	2	5400	1 32-c.m. B.L.R., 11 13-c.m. Q.F., 6 M. .	4 f. tu. or l. car	1890	..	16·00	..	..
cr.	**Kaimon**	1490	210 0	32 0	steel	16 5	1	1250	1 17-c.m. 6-ton B.L.R. (Krupp), 6 12-c.m. do., 2 l.	..	1882	..	12·00	..	..
g.v.	**Katsuraki** . . .	1476	206 9	36 0	composite	15 0	2	1600	2 17-c.m. B.L.R. (Krupp), 5 12-c.m. do.	..	1885	..	13·00	..	..
„	**Maya**	615	164 0	27 0	„	10 0	..	700	1 24-c.m. B.L.R. (Krupp), 1 12-c.m. do., 2 M.	..	1886	..	12·00	..	..
c.d.s.	**Metsuchima** . . P.	4277	325 0	50 10	..	21 2	2	5400	1 32-c.m. B.L.R., 11 12-c.m. Q.F., 6 M. .	4 f. tu. or l. car	1890	..	16·00	..	..
„	**Muzasi**	1476	206 9	36 0	composite	15 0	2	1600	2 17-c.m. B.L.R. (Krupp), 5 12-c.m. do. .	..	Bldg.	..	13·00	..	..

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cr.	**Naniwa** . . .	P.	3650	300	0	46	0	steel	18	6	2	7235	2 26-c.m. 28 ton B.L.R. (Armstrong), 6 15-c.m. 5-ton (Krupp), 2 Q.F., 14 M.	4 f. tu. or l.car	1885	..	18·72	800	9000 at 13 kts.
d.v.	**Nis-chin**		874	204	0	29	0	wood	14	6	1	1270	1 7-in. M.L.R. (Armstrong) 6 30-pdr. (smoothbore)	..	..	..	11·00	..	..
„	**Oschima** (Medea type)	P.	..	..		..		..	..	..	..	..	.. .. ..	..	Bldg.	..	..	..	..
cr.	**Shiodo**		2400	300	0	41	0	steel	..	..	..	..	11 12-c.m. (4·7-in.) B.L.R. . . .	3 f. tu. or l. car	Bldg.	..	19 00	240	..
„	**Sei-ki**		810	200	0	30	0	„	13	2	1	720	1 15-c.m. B.L.R. (Krupp), 4 12-c.m. do. .	..	1875	..	11·00	130	..
„	**Takao**		1760	230	0	33	0	composite	13	0	2	2330	4 6-in. B.L.R., 1 4¾-in. do. . . .	2 f. tu. or l. car	1885	..	15·00	..	..
„	**Takachiho** . .	P.	3650	300	0	46	0	steel	18	6	2	7500	2 26-c.m. 28-ton B.L.R. (Armstrong), 6 15-c.m. 5-ton do., 2 Q.F., 14 M.	4 f. tu. or l.car	1885	..	18·72	800	9000 at 13 kts.
corv.	**Ten-rio**		1490	200	0	32	0	wood	16	5	1	1250	1 17-c.m. 6-ton B.L.R. (Krupp), 6 12-c.m. do., 2 l.	..	1882	..	12·00	..	..
g.v.	**Tiokai**		615	154	0	27	0	steel	10	0	..	700	1 21-c.m. Krupp, 1 12-c.m. do., 2 M.. .	..	1887	..	10·0;	..	..
„	**Tisima**		700	150	0	25	0	„	16	0	..	..	.. .. ..	..	1889	..	..	..	..
„	New ship		..	167	0	29	6	„	16	0	..	..	.. .. ..	..	Bldg.	..	..	..	..
„	**Tscho-kai**. . . .		613	155	0	27	0	steel	9	0	1	950	1 21-c.m. B.L.R., 1 12-c.m. do., 2 M. . .	..	1887	..	10·00	..	..
corv.	**Tsukuba** (training ship for cadets)		1980	194	0	36	0	wood	18	0	1	350	8 guns	..	1883	..	..	..	..
„	**Tsukushi** . . .		1500	210	0	35	2	„	15	0	2	2887	2 10-in. 25-ton B.L.R. (Armstrong), 4 5-in. 4-ton do., 4 M., 2 l.	2 f. tu. or l.car	1882	..	17·00	250	..
„	**Wun Yo**		470	120	0	24	0	composite	11	0	1	..	4 M.L.R.	..	1868		10·00	60	..
d.v.	**Yaeyama**. . . .		1600	315	0	34	6	..	15	0	2	5400	3 12-c.m. B.L.R., 6 M.	2 l. car.	1889	..	20·00	..	..
„	**Yamato**		1476	206	9	36	0	„	15	0	1	1600	2 17-c.m. B.L.R. (Krupp), 5 12-c.m. do., 2 M.	2 f. tu. or l.car	1885	..	13·00	..	..

Paddle despatch vessel.—Jungei, 1465 tons; 1430 horse-power; Kasuga, 1015 tons; 300 nominal horse-power.

Gunboats.—Moschum, Raiden, Tschintagata; 100 to 875 tons; 60 to 80 nominal horse-power.

Also yachts, training-ships, transports, &c.

Torpedo boats.—One built in this country and sent out in pieces and reinstated in Japan, 166 ft. long, 19½ ft. broad, of 200 tons displacement, 1600 horse-power, and 20 knots speed; and two others of the same type.

Four sea-going torpedo boats of 40 tons, and 20 knots speed.

Seventeen other first class boats and 5 second class boats.

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MEXICO.—Unarmoured Ships.

g.v., gun-vessel.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v	**Democrata**	450	140 0	24 10	iron	11 2	1	600	2 6½-in. 4-ton M.L.R., 2 20-pdr. B.L.R. (Vavasseur)	..	1875	..	11·00	..	..
„	**Mexico**	450	140 0	24 10	„	11 2	1	600	2 6½-in. 4-ton M.L.R., 2 20-pdr. B.L.R. (Vavasseur)	..	1875	..	11·00	..	..

Mexico has also two 10-knot gunboats of small size, the Independencia and the Libertad, 125 ft. long and of 425 horse-power.
Also five first-class torpedo boats built or building.

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NETHERLANDS.—Armoured Ships.

a.g.b., armoured gunboat; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Turret.	Backing.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s.t.	Bloedhond . (iron)	1530	180 0	46 3	5½	8	9¾	9 6	2	680	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1869	..	8·50	90	..
„	Buffel . . (iron)	2198	195 6	40 0	6	8	9¾	15 6	2	2000	2 23-c.m. 13-ton M.L.R. (Armstrong), 2 M.	..	1868	..	12·40	150	..
„	Cerberus . . (iron)	1530	180 0	44 0	5½	8	9¾	9 7	2	617	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1869	..	8·50	90	..
„	Draak . . (iron)	2156	201 5	49 3	8	9	11¾	10 10	2	807	2 28-c.m. B.L.R. (Krupp), 2 M. .	..	1877	..	8·00	100	..
„	Guinea . . (iron)	2378	195 6	40 0	6	8	9¾	16 9	2	2000	2 23-c.m. 13-ton B.L.R. (Armstrong), 2 M.	..	1870	..	12·00	135	..
„	Haai . . (iron)	1566	186 4	44 0	5½	8 5½ C. Tower	9¾	10 2	2	672	2 23-c.m. 13-ton B.L.R. (Armstrong), 2 M.	..	1871	..	7·00	70	..
„	Heiligerlee . (iron)	1530	180 0	43 7	5½	8 4½ C. Tower	9¾	9 6	2	630	2 23-c.m. 13-ton B.L.R. (Armstrong), 2 M.	..	1868	..	8·00	90	..
„	Hijena . . (iron)	1566	186 4	44 0	5½	8 5½ C. Tower	9¾	10 2	2	654	2 23-c.m. 13-ton M.L.R. (Armstrong), 2 M.	..	1871	..	7·00	70	..
a.g.b.	Isala . . (iron)	367	150 11	24 11	4	5	5	4 3	2	306	2 12-c.m. B.L.R. (Krupp) . .	..	1876	..	7·00	27	..
t.	Koning der Nederlander (iron)	5400	269 0	49 3	8	9 8 Pt. House.	11¾	20 0	2	4500	4 28-c.m. 25-ton M.L.R. (Armstrong), 4 12-c.m. B.L.R. (Krupp)	..	1874	..	11·00	620	..
c.s.t.	Krokodil . (iron)	1530	180 0	43 7	5½	8 4½ C. Tower	9¾	9 6	2	630	2 23-c.m. 13-ton B.L.R. (Krupp), 2 M.	..	1868	..	8·00	90	..
„	Luipard . . (iron)	1525	186 4	44 0	5½	8 5½ C. Tower	9¾	9 2	2	680	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1876	..	7·00	70	..

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NETHERLANDS.—Armoured Ships—*continued.*

a.g.b., armoured gunboat; ***c.s.***, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Turret.	Backing.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s.t.	**Matador** . . (iron)	1935	201 5	49 3	5½	9	9¾	10 2	2	691	2 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1878	..	7·00	100	..
a.g.b.	**Merva** . . (iron)	367	150 11	24 11	4	5	5	4 3	2	395	2 12-c.m. B.L.R. (Krupp) . .	..	1879	..	7·00	27	..
„	**Mosa** . . (iron)	367	150 11	24 11	4	5	5	4 3	2	400	2 12-c.m. B.L.R. (Krupp) . .	..	1878	..	7·00	27	..
c.s.t.	**Panter** . . (iron)	1566	186 4	44 0	5½	8 5½ C. T.	9¾	10 2	2	660	2 23-c.m. 13-ton B.L.R. (Armstrong), 2 M.	..	1870	..	7·00	70	..
t.	**Prinsco Wilhelmina der Niederlanden** (steel, copper sheathed)	4600	328 0	49 3	..	11	3 Deck	19 8	2	5900	1 28-c.m. B.L.R., 1 21-c.m. Do., 2 17-c.m. Do., 2 7·5 Do., 8 Q.F., 6 M.	..	Bldg.	..	16·0	..	..
„	**Prinz Hendrik der Nederlander** (iron)	3375	229 7	42 7	4½	5½	9¾	18 1	1	2000	4 23-c.m. 13-ton M.L.R. (Armstrong), 4 12-c.m. B.L.R. (Krupp)	..	1866	..	12·00	350	..
„	**Reinier Claesen** (steel)	2490	229 7	44 3	4¾	11	3 steel deck.	15 0	2	2400	1 21-c.m. (Krupp), 1 17-c.m. Do., 1 75 Do., 3 37-m.m. Q.F., 3 M.	2 l.car.	Bldg.	..	13·0	..	..
a.g.b.	**Rhenus** . . (iron)	367	150 11	24 11	4	5	5	4 3	2	310	2 12-c.m. B.L.R. (Krupp) . .	..	1877	..	7·00	27	..
c.s.t.	**Schorpioen** . (iron)	2175	193 3	38 0	6	8 4½ Pt. Tower.	11¾	15 10	2	2225	2 28-c.m. 28-ton B.L.R. (Krupp) .	..	1868	..	12·00	200	1030
„	**Stier.** . . (iron)	2069	194 10	38 0	6	8 4½ P. T.	9¾	15 6	2	2257	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1868	..	12·40	160	..
„	**Tijger** . . (iron)	1414	187 0	44 0	5½	8 4½ C. T.	9¾	8 10	2	684	2 23-c.m. 13-ton M.L.R. (Armstrong), 2 M.	..	1868	..	8·00	70	..
a.g.b.	**Vahalis** . . (iron)	340	120 5	27 6	4½	..	7	5 3	2	243	2 7½-c.m. B.L.R. (Krupp) . .	..	1870	..	6·00	22	..
c.s.t.	**Wesp** . . (iron)	1566	186 4	44 0	5½	8	9¾ 5½ C. T.	10 2	2	744	1 28-c.m. 28-ton B.L.R. (Krupp), 2 M.	..	1871	..	7·00	70	..

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NETHERLANDS.—Unarmoured Ships.

((I) denotes vessels of the Dutch Indian Navy.)

corv., corvette; *fr.cr.*, frigate-built cruiser; *cr.*, cruiser; *g.v.*, gun-vessel; *sl.*, sloop.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
sl.	Alkmaar . . .	1010	154 3	30 2	composite	15 9	1	830	1 15-c.m. B.L.R., 6 12-c.m. do. (Krupp) .	..	1874	..	10·00	130	..
g.v.	Arend (I) . . .	340	125 0	21 0	,,	10 0	1	320	2 3-inch M.L., 2 l.	..	1880	..	10·50	..	..
,,	Aruba . . .	770	147 7	29 6	,,	12 5	1	413	1 15-c.m. M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp), 2 M.	..	1873	..	9·00	100	..
fr.cr.	At-jeh . . .	3160	262 5	39 4	iron & wood	20 7	1	2700	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 6 M.	..	1876	..	14·50	380	3000
g.v.	Bali (I) . . (was Eustatius)	853	147 7	29 6	,,	11 10	1	516	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp), 2 M.	..	1878	..	9·50	100	..
,,	Banda (I) . . .	695	137 10	27 7	composite	11 10	1	198	1 16-c.m. M.L.R., 2 12-c.m. B.L.R. (Krupp) .	..	1872	..	9·00	80	..
,,	Bandjermassin (I) .	732	137 10	28 10	,,	11 10	1	370	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. Krupp).	..	1874	..	9·50	85	..
,,	Batavia (I) . . .	853	147 7	29 6	iron & wood	11 10	1	405	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp).	..	1876	..	9·00	100	..
,,	Bencoolen (I) . .	853	147 7	29 6	,,	11 10	1	516	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp) .	..	1879	..	9·60	100	..
,,	Bonaire . . .	853	147 7	29 6	,,	11 10	1	412	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp), 2 M.	..	1877	..	9·00	100	..
,,	Ceram (I) . . .	550	157 4	25 4	steel	10 6	1	650	3 12-c.m. B.L.R. (Krupp), 4 M. . .	..	1887	..	11·00	60	..
,,	Condor (I) . . .	320	126 0	21 0	composite	10 0	1	300	2 2¾-in. B.L.R., 2 6-Pr. Q.F. . . .	..	1885	..	10·00	25	..
corv.	Curaçoa (I). . .	2030	190 3	39 4	wood	18 4	1	680	8 16-c.m. M.L.R.	..	1863	..	..	..	..
fr.cr.	De Ruyter . . .	3160	262 5	39 4	iron & wood	20 7	1	3305	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 4 M.	..	1880	..	14·50	380	3000
g.v.	Flores (I) . . .	550	157 0	25 6	steel	10 6	1	650	3 4¾-in. 2-ton B.L.R.	..	1887	..	11·00	60	..
,,	Halik (I) . . .	..	125 0	20 0	composite	10 0	1	..	.. ..	..	1878	..	8·50	..	..
cr.	Java (I) . . .	1100	197 0	31 3	iron & wood	12 3	1	1020	1 6-in. B.L.R., 3 4¾-in. do. . . .	..	1885	..	10·60	125	..

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NETHERLANDS.—Unarmoured Ships—*continued.*

((I) denotes vessels of the Dutch Indian Navy.)
corv., corvette; *fr.cr.*, frigate-built cruiser; *cr.*, cruiser; *g.v.*, gun-vessel; *sl.*, sloop.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
fr.cr.	Johan Willem Friso	3160	262 5	39 4	iron & wood	20 7	1	3000	6 17-c.m. 6-ton B.L.R., (Krupp), 8 12-c.m. do. 4 M.	..	1886	..	14·50	380	3000
„	Koningin Emma der Nederlanden	3160	262 5	39 4	„	20 7	1	2750	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 4 M.	..	1879	..	14·60	380	3000
g.v.	Macassar (I) . .	853	147 7	29 6	„	11 10	1	394	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1876	..	9·00	100	..
„	Madura (I) . .	853	147 7	29 6	„	11 10	1	559	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp) .	..	1880	..	9·70	100	..
„	Padang (I). . .	853	147 7	29 6	„	11 10	1	409	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp) .	..	1878	..	9·40	100	..
„	Palembang (I) . .	732	137 10	28 10	composite	11 10	1	370	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1874	..	8·50	85	..
„	Pontianak (I) . .	832	147 7	29 6	„	11 10	1	360	1 18.-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1873	..	8·50	85	..
„	Riow (I) . . .	832	147 7	29 6	„	11 10	1	204	1 16-c.m. M.L.R., 2 12-c.m. B.L.R. (Krupp)	..	1872	..	8·00	80	..
„	Samarang (I) . .	853	147 7	29 6	iron & wood	11 10	1	460	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1876	..	9·00	100	..
„	Sambas (I) . . .	732	137 10	28 10	composite	11 10	1	374	1 18-c.m. 7-ton M.L.R. (Armstrong), 2 12-c.m. B.L.R. (Krupp)	..	1874	..	8·50	85	..
„	Sommelsdijk . .	890	147 7	31 2	iron & wood	11 9	1	732	1 15-c.m. B.L.R., 3 12-c.m. do. (Krupp), 2 1.	..	1882	..	10·00	95	..
cr.	Sumatra . . P.	..	..	..	steel	..	2	3750	1 21-c.m. B.L.R., 1 15-c.m. do. . . .	..	Bldg.	..	17·0	..	..

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g.v.	**Surinam** . . .	853	147	7	29	6	„	11	10	1	440	1 15-c.m. B.L.R. (Krupp), 3 12-c.m. do., 2 l.	..	1877	..	9·00	95	..
fr.cr.	**Tromp** . . .	3160	262	5	39	4	„	20	7	1	2772	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 4 M.	..	1877	..	14·30	380	3000
corv.	**Van Galen** . . .	2160	193	6	41	6	wood	18	2	1	833	4 16-c.m. B.L.R., 6 12-c.m. do. (Krupp), 2 M.	..	1872	..	10·00	400	..
fr.cr.	**Van Speyk** . . .	3160	262	5	39	4	iron & wood	20	7	1	3000	6 17-c.m. 6-ton B.L.R., 8 12-c.m. do. (Krupp), 4 M.	..	1882	..	14·20	380	3000
g.v.	**Zeemeeuv** (I) . .	340	125	0	20	0	composite	10	6	1	..	.. ..	..	1878	..	8·00	..	..
corv.	**Zilveren Kruis** . .	2160	193	6	41	7	wood	18	4	1	1440	4 16-c.m. B.L.R., 6 12-c.m. do. (Krupp), 4 M.	..	1869	..	10·00	300	..
g.v.	**Zwalur** (I) . . .	340	123	0	21	0	composite	10	0	1	320	2 3-inch B.L.G., 2 2-inch do. . . .	..	1882	..	10·50	..	..

Gunboats (*Staunch class*).—Balder, Braga, Bulgia, Dufa, Freijr, Hadda, Hefring, Heimdall, Njord, Thor, Tijr, Udur, Ulfr, Vali, Vidr, Wodan, of 245 tons, and of 100 to 250 horse-power; also, Bever, Brak, Das, Dog, Ever, Fret, Geep, Gier, Havik, Hydra, Lynx, Raaf, Sperwer, Vos, of 195 tons, and 100 to 250 horse-power.

Steel gunboat.—"No. 3," 108 tons and 172 I.HP.

First-class torpedo boats, ten seagoing, of about 80 tons displacement and 20 to 23 knots (built and building); two of 46 tons displacement and 21½ knots; and 20 boats of 29 tons displacement and 17 knots.

Also several large paddle steamers, training ships, transports, store-ships, surveying vessel, &c.

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NORWAY.—Armoured Ships.

c.s., *t.*, coast-service turret ship; *a.g.b.*, armoured gunboat.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Turret.	Belt.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s., t.	**Mjolner** .	1515	203 5	45 11	12	5	39	11 10	1	450	2 27-c.m. 18-ton M.L.R. (Armstrong), 1 M., 1 l.	..	1868	66,800	8·00	138	..
„	**Skorpionen**	1447	200 2	45 11	12	5	39	11 6	1	350	2 27-c.m. 18-ton M.L.R. (Armstrong), 1 M., 1 l.	..	1866	..	6·00	138	..
„	**Thor** . .	2003	203 5	49 3	14¼	7	38	13 2	1	600	2 27-c.m. 20-ton M.L.R. (Armstrong), 1 M., 1 l.	..	1872	..	8·00	200	..
„	**Thrudvang.**	1515	200 2	45 11	12	5	39	11 10	1	500	2 27-c.m. 18-ton M.L.R. (Armstrong), 1 M., 1 l.	..	1867	..	8·00	138	..
a.g.b.	**Viking** .	1113	203 6	30 6	1½-in. steel deck.			..	2	2000	2 15-c.m. B.L.R., 4 6-ton do. Q.F., 6 M. . .	2 l. car.	Bldg.	..	..	..	..

Note.—The first four ships named above are built of iron; the last of steel.

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NORWAY.—Unarmoured Ships.

corv., corvette; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	tons.	tons.	knots.
g.v.	**Ellida**	1000	187 0	32 8	wood	14 4	2	900	5 15-c.m. 4-ton Krupp, 1 12-c.m. do., 1 l., 2 M.	1 f. tu. or l.car	1880	..	12·00	97	..
fr.cr.	**Kong Sverre** . .	3472	252 7	49 3	,,	22 4	1	1800	2 20-c.m. 7-ton M.L.R. (Armstrong), 4 17-c.m. M.L.R., 16 16-c.m. do., 22 8-in. smooth-bore, 6 l.	..	1860	..	11·00	377	..
corv.	**Nord Stjernen** . .	1609	216 6	39 4	,,	17 9	1	800	4 16-c.m. 3-ton M.L.R., 10 8-in. smooth-bore, 3 l.	..	1862	..	9·00	195	..
corv.	**Nornen.** . . .	959	172 0	36 0	wood	15 9	1	240	8 16-c.m. and 4 12-c.m. guns . . .	21. car.	1855	..	7·00	..	..
fr.cr.	**St. Olaf.** . . .	2182	229 7	42 7	,,	18 9	1	1200	1 20-c.m. 7-ton M.L.R. (Armstrong), 1 17-c.m. 5-ton, M.L.R., 12 16-c.m. 3-ton do., 20 8-in. 3-ton smooth-bores, 4 l.	..	1856	..	10·00	200	..
g.v.	**Sleipner** . . .	580	173 10	25 11	iron	9 6	2	800	1 26-c.m. 22-ton B.L.R., 1 15-c.m. 4-ton do. (Krupp), 1 M.	1 f. tu. or l.car	1877	..	12·00	80	..

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In addition to the ships and vessels given in the alphabetical lists, the Norwegian Navy possesses the following:—

Eleven Gunboats.—Brage, Gor, Nor, Riukan, Sarpen, Tyr, Uller, Vale, Vidar (189 to 280 tons; 100 to 450 indicated horse-power), one large gun and machine guns in each.

Sixteen smaller Gunboats.—Aasgardsrand, Arendal, Brevig, Christiansand, Dverg, Horten, Karmo, Kongsberg, Langesund, Laurvig, Lillesand, Nök, Porsgrund, Skien, Skudernoes, Tönsberg (55 tons, 70 indicated horse-power, 7½ knots); each armed with one 5½-inch gun. Trold (97 tons; 65 indicated horse-power); also several smaller gunboats.

Torpedo boats.—Fifteen first-class; three second-class; and two Miners.

Also paddle steamer, transport, training ships, &c.

PERU.

Since the war with Chili the Peruvian Navy has been much reduced, and comprises only the following seagoing steamers:—

Diogenes and Lima (late Socrates), built in 1881, of 1700 tons displacement, 1800 horse-power, and 16-knot speed; also Callao, Colon, Duque de Guisa, Iquique, Lerzundi, Rimac (2100 tons, 13 knots), Tumbez, and the training frigate Apurimac.

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PERSIA.

d.v., despatch vessel.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
d.v.	**Persepolis** . . .	1200	206 9	34 2	steel	19 7	1	454	1 10-c.m. B.L.R. (Krupp), 4 7-c.m. do . .	..	1885	..	10·00	..	..

Also one small double-screw steamer, the Sicza, for police duties, and a small 7-knot gunboat.

PORTUGAL.—Armoured Ship.

c.b., central battery-ship.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Vasco da Gama** (iron) .	2422	200 0	40 0	9	10	..	18 0	2	3605	2 26-c.m. 18-ton B.L.R. (Krupp), 2 15-c.m. do., 3 40-pdr. B.L.R. (Armstrong), 1 M.	..	1876	103,800	13·20	300	..

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PORTUGAL.—Unarmoured Ships.

corv., corvette; *g.v.*, gun-vessel; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	Affonso de Albuquerque	1111	205 0	33 2	iron & wood	12 3	1	1055	2 6-in. B.L.R. (Armstrong), 5 5-in. do., 3 M.	..	1884	..	12·00	150	..
,,	Bartholomeu Dias .	1243	207 0	37 5	wood	20 6	1	400 (nom.)	1 6-in. B.L.R., 10 40-pdrs. . . .	..	1858	..	10·00	360	..
g.v.	Bengo. . .	462	125 7	24 7	composite	8 10	1	400	1 6-in. B L.R., 2 15-c.m. do. . . .	..	1879	..	10·00	80	..
,,	Cacongo . .	580	141 0	24 9	steel	10 8	1	400	2 6-in. 4-ton B.L.R.	..	1886	..	11·00	80	..
,,	Diego Cam . .	587	143 0	25 11	composite	10 10	1	400	2 15-c.m. 4-ton B.L.R.	..	1888	..	9·00	..	..
,,	Diu	640	147 0	27 0	,,	13 0	1	700	1 15-c.m. B.L.R. (Krupp), 4 M. . . .	..	Bldg.	..	..	..	..
,,	Don Luiz I. . .	600	..	..	steel	..	2	..	4 10½-c.m. B.L.R., 3 6½-c.m. Q.F., 3 M. .	..	Bldg.	..	11·0	..	..
,,	New Ship . . .	600	..	..	steel	..	2	..	4 10½-c.m. B.L.R., 3 6½-c.m. Q.F., 3 M.	..	Bldg.	..	11·0	..	..
,,	Douro . . .	587	143 0	25 11	,,	10 10	1	400	2 15-c.m. 4-ton B.L.R.	..	1873	..	9·00	80	..
corv.	Duque de Terceira .	1418	180 2	34 2	wood	14 9	1	220 (nom.)	1 17-c.m. M.L.R. (Armstrong), 4 40-pdr. do.	..	1864	..	10·00	200	..
,,	Estephania . .	2368	202 5	41 4	,,	17 8	1	400 (nom.)	9 80-pdr. M.L. (Palliser) . . .	..	1859	..	10·00	360	..
g.v.	Liberal . . .	610	140 0	25 10	iron & wood	11 0	1	500	1 6-in. 4-ton B.L.R. (Armstrong), 6 M., 2 l.	..	1884	..	10·00	90	..
corv.	Mindello . . .	1124	169 11	35 9	composite	13 5	1	900	2 7-in. 4-ton M.L.R. (Armstrong), 4 20-pdr. do. 2 l.	..	1876	..	11·00	100	..
g.v.	Mandovi . . .	462	125 7	24 7	,,	8 10	1	400	1 6-in. B.L.R., 2 M., 2 l.	..	1879	..	10·00	80	..
,,	Quanza . . .	587	143 0	25 11	,,	10 10	1	100 (nom.)	3 15-c.m. 4-ton B.L.R.	..	1877	..	8·00	80	..

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corv.	**Rainha de Portugal** .	1124	169 11	35 9	„	13 5 1	900	2 7-in. M.L.R. (Armstrong), 4 20-pdr. do., 2 l.	..	1876	..	11·00	100	..
g.v.	**Rio Ave** . . .	380	120 0	22 0	„	10 0 1	300	1 64-pdr. M.L.R., 2 40-pdr. do.	..	1880	..	8·00	65	..
„	**Rio Lima** . . .	610	148 11	28 3	„	10 6 1	500	1 15-c.m. 4-ton B.L.R. (Armstrong), 4 40-pdr. do.	..	1875	..	10·00	90	..
„	**Sado**	610	148 11	28 3	„	10 6 1	500	1 15-c.m. 4-ton B.L.R. (Armstrong), 4 40-pdr. do.	..	1875	..	10·00	90	..
„	**Tamega** . . .	610	148 11	28 3	„	10 6 1	500	1 15-c.m. 4-ton B.L.R. (Armstrong), 4 40-pdr. do.	..	1875	..	10·00	90	..
„	**Tejo**	587	143 0	25 11	„	10 10 1	400	2 15-c.m. 4-ton B.L.R.	..	1869	..	10·00	80	..
„	**Vouga** . . .	721	161 0	27 7	iron & wood	11 10 1	600	1 6-in. B.L.R., 2 M., 4 l.	..	1882	..	9·00	100	..
„	**Zaire**	640	140 0	25 10	„	11 10 1	500	1 6-in. B.L.R. (Armstrong), 6 M., 2 l. .	..	1884	..	10·00	20	..
„	**Zambezia** . . .	590	143 0	26 0	composite	10 10 1	400	2 6-in. B.L.R., 6 M.	..	1886	..	9·00	80	..
cr.	4 Cruisers (not named) P.	4500	..	..	steel	.. 2	..	4 15-c.m. B.L.R., 4 6½-c.m. Q.F., 4 M. . .	l. car.	Bldg.	..	20·0	..	..

Gunboats.—Two Cazono and Massabi, of steel, of 220 tons displacement and 450 horse-power, and 11 knots speed, and the Vilhena, of 310 tons displacement.

Torpedo boat.—Espadarte, first-class, 86 ft. long, of 54 tons, and of 19 knots speed.

Three torpedo boats, 110 feet long, 12 feet broad, 65 tons displacement, 700 indicated horse-power, 20 knots speed, built at Poplar in 1886. Five first-class Schichan torpedo boats building.

Torpedo vessel or Miner.—Fulminante.

Three transports, seven screw steamers built and building, besides training ships, yachts, &c.

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ROUMANIA.

The Kingdom of Roumania has—

The Elizabeta, a protected cruiser, built in 1887. She is 230 ft. long, 32 ft. 10 in. broad, has 1320 tons displacement, 4500 horse-power, 18 knots speed, and carries 4 17-c.m. B.L.R. guns, 4 quick-firing guns, 4 machine guns, and 4 torpedo launching tubes. Also

Three coast-guard vessels—Olthul, Siretul, and Bistriti—length, 100 ft.; breadth, 13½ ft.; draught of water, 6 ft.; speed, 11 knots natural draught, and 13¼ knots with forced draught; indicated horse-power corresponding to 11 knots speed was 160. They carry 3 machine guns. They were built by the Thames Ironworks Co., and left the Thames in August, 1888.

There are also

Five gunboats of small size (45 to 110 tons).

Two paddle yachts, Romania and Stefancel Mare.

One screw steamer (two guns, two machine guns).

One steamer used for towing in torpedo work.

Three first-class torpedo boats, 120 ft. long, 56 tons displacement, and 21 knots speed.

Two second-class torpedo boats.

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RUSSIA.—Armoured Ships.

(B.S., Black Sea Fleet.) *a.c.*, armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Turret or Battery.					Guns. B.L.R. are of Russian Krupp pattern.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	knots.
c.s., t.	Adm. Chichagoff (iron)	3511	254 3	42 7	6	6	17½	18 9	1	2060	2 11-in. 28-ton B.L.R., 3 M., 4 l.	..	1868	..	10·00	300	..
„	Adm. Greig . (iron)	3593	252 7	42 7	4½	6	17½	20 11	1	2031 3	11-in. 28-ton B.L.R., 3 M., 4 l.	..	1868	..	10·00	300	..
„	Adm. Lazareff (iron)	3556	252 7	42 7	4½	6	17½	20 4	1	2004	3 11-in. 28-ton B.L.R., 4 l. .	..	1867	..	10·00	300	..
a.c.	Admiral Nachimoff (steel, copper sheathed)	7782	330 0	61 0	10	8 barbette	3-in. steel dk.	25 9	2	8000	8 8-in. 13-ton B.L.R., 10 6-in. 6-ton do., 12 M., 4 l.	4 f. tu. or l.car	1885	572,000	16·50	1200	..
c.s., t.	Adm. Spiridoff (iron)	3740	254 3	42 7	6	6	17½	19 1	1	2007	2 11-in. 28-ton B.L.R., 3 M., 4 l.	..	1868	..	10·00	300	..
b.	Alexander II. (steel, copper sheathed)	8440	326 0	67 0	14	10 barbette battery 4-inch armour in front of each of the 9-in. guns	2½-in. steel dk.	23 0	2	8000	2 12-in. 50-ton B.L.R., 4 9-in. 19-ton do., 8 6-in. 6-ton do., 10 Q.F., 4 M., 4 l.	4 f. tu. or l.car	1887	..	15·50	..	..
c.s., t.	Bronenosetz . . (iron)	1482	200 0	45 11	5 1-in. plates	11 1-in. plates	..	12 2	1	481	2 9-in. 15-ton B.L.R. . .	..	1864	..	7·00	..	..
b.	Catherine II. B.S. (iron and steel)	10,150	331 0	69 0	16	14 barbette	12-in. and 3-in. steel dk.	27 1	2	11,000	6 12-in. (56-ton) B.L.R., 7 6-in. 6-ton do., 16 Q.F.	7 f. tu. or l.car	1886	900,000	16·00	886	1350 at 14 knots
c.s., t.	Charodeika . (iron)	2026	206 9	42 7	4½	6 turret	17½	12 2	2	786	4 9-in. 15-ton B.L.R., 1 M. .	..	1867	..	8·00	250	..
a.c.	Dimitri Donskoi (steel, copper sheathed)	5893	296 5	52 0	6	unarmoured	steel dk. 2½-in.	24 4	2	7000	2 8-in. 13-ton B.L.R., 14 6-in. 6-ton do., 14 M., 4 l.	4 f. tu. or l.car	1883	..	15·50	400	4800
b.	Dvenadsat Apostoloff	8076	320 0	60 0	14	12 (conning tower 5 ins.)	..	25 8	2	11,500	4 12-in. 52-ton B.L.R., 4 9-in. 15½-ton do., 10 3-in. Q.F. & M. This was the original intention, but smaller guns now meet with favour.	6 f. tu. or l.car	1890	..	15·00	..	..
c.s., t.	Edinorog . (iron)	1407	200 0	45 11	5 1-in. plates	11 1-in. plates	39	..	1	460	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..

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RUSSIA.—Armoured Ships—*continued.*

(B.S., Black Sea Fleet.) *a.c.*, armoured cruiser; *a.g.b.*, armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.b.*, central-battery ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour. Belt.	Armour. Turret or Battery.	Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns. R.L.R. are of Russian Krupp pattern.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.	inches.	inches.	ins.	ft. in.						£	knots.	tons.	knots.
a.c.	**Gangoot** . . .	6592	278 0	62 0	partial belt 16	armoured casemate	..	21 0	2	6000	6 9-in. 19-ton B.L.R., 6 6-in. 6-ton do.	..	1890	..	14·50	..	..
„	**General Admiral** (iron, copper sheathed)	4604	285 5	49 3	6	unarmoured	9¾	22 11	1	4472	6 8-in. 9-ton B.L.R., 2 6-in. do., 7 M., 5 l.	2 f. tu. or l.car	1873	..	12·00	1000	..
a.c.	**Gerzog Edinburgski** (iron and wood)	4604	285 5	49 3	6	unarmoured	9¾	22 11	1	5222	4 8-in. 9-ton 5 6-in. 4-ton B.L.R., 14 Q.F., 6 l.	2 f. tu. or l.car	1875	..	12·50	1000	..
b.	**Gheorghy Pobyedonosets**	10,280	320 0	69 0	16	..	..	26 7	2	15000	6 12-in. 56-ton B.L.R., 7 6-in. 6-ton do.	7 f. tu. or l.car	Bldg. at Sebastopol.	431,000 hull and engines	16·00	700	..
a.g.b.	**Gremgastchy** . .	1500	220 0	40 0	5	..	..	..	2	2000	.. ..	..	Bldg.	..	..	..	..
a.g.b.	**Grozyashtchy** . .	1492	229 0	41 8	5	..	..	11 0	2	2000	1 9-in. 19-ton B.L.R., 1 6-in. 6-ton do.	2 f. tu. or l.car	1890	..	15·00	..	..
c.b.	**Kniaz Pojarski** (iron)	5007	272 4	49 3	4½—3½	4½	..	23 11	1	new machinery	8 8-in. 9-ton B.L.R., 2 6-in. 4-ton do., 4 M., 8 l.	..	1867	..	12·50	600	..
c.s., t.	**Koldun** . . .(iron)	1666	200 0	45 11 5	1-in. plates	11 1-in. plates	39	12 0	1	481	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
c.s., br.	**Kreml** . . .(iron)	3664	219 10	52 5	4½	4½	17½	17 4	1	1121	12 8-in. 9-ton B.L.R., 2 6-in. do., 2 M., 6 l.	..	1864	..	6·00	..	..
c.s., t.	**Latnik** . . .(iron)	1515	200 0	45 11 5	1-in. plates	11 1-in. plates	39	12 2	1	490	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
„	**Lava** . . .(iron)	1591	200 0	45 11 5	1-in. plates	11 1-in. plates	39	12 0	1	335	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
a.c.	**Minin** . . .(iron)	6168	298 6	49 3	7	unarmoured	..	25 3	1	5290	4 8-in. 9-ton B.L.R., 12 6-in. 4-ton do., 12 Q.F., 4 l.	..	1878 altered	..	13·00	..	..
c.s., br.	**Netron-Menya** .(iron)	3494	219 10	53 0	4½	4½ battery	9¾	16 5	1	1632	12 8-in. 9-ton B.L.R., 2 M., 4 l.	..	1864	..	8·00	500	..
a.c.	**Navarin** . (steel)	9476	338 0	67 0	16	12	..	25 0	2	9000	4 12-in. 50-ton B.L.R., 8 6-in. 6-ton do.	6 f. tu. or l.car	Building at Franco-Russian Works		16·0	..	..
„	**Nicolai I.** (steel, copper sheathed)	8440	326 0	67 0	14	10 turret 6-in. battery	2½-in. steel dk.	25 3	2	8000	2 12-in. 52-ton B.L.R. 4 9-in. 19-ton do., 8 6-in. 6-ton do., 4 Q.F., 6 M., 4 l.	4 f. tu. or l.car	1888	453,000	15·00	..	..

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a.g.b.	**Nikopol**, B.S. (iron & wood)	273	98	5	27	10	3	..	9¾	5	0	2	320	..	..	..	1868	..	8·00	..	..
circular c.s.	**Novgorod**, B.S. (iron, copper sheathed)	2706	101	0	101	0	9—7 with Hughes' Backing.	9	*	13	5	6	2000	2 11-in. 29-ton B.L.R., 2 M., 2 l.	..	1873	..	6·00	200	..
a.g.b.	**Ofrainy** . . .	1500	220	0	40	0	5	..	..	..		2	2000	..	..	..	Bldg.	..	..	..	..
a.c.	**Pamyat Azova** (steel) (wood sheathing over armour)	6000	377	0	50	0	9	8 barbette	10-in. 2½-in. steel dk.	25	0	2	11500	2 8-in 13½-ton B.L.R., 12 6-in. 6-ton do., 12 Q.F. and M.	1 f. tu. 2 l. car	1887	350,000	18·00	1000	12,000
c.s., t.	**Perun** . . . (iron)	1549	200	0	45	11	5 1-in. plates	11 1-in. plates	..	12	2	1	338	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
t.	**Peter the Great** .(iron)	8749	328	2	62	4	14—8	8+6 turret	9¾	23	0	2	8258	4 12-in. 40-ton B.L.R., 7 Q.F., 4 l.	1 f. tu. or l.car	1872	..	13·00	1200	..
br.	**Petropaulowski**‡ (wood)	6240	294	0	56	0	4½	4½	..	24	0	1	2800	21 8-in. 9 ton B.L.R., 1 6-in do.	..	1865	..	11·00	..	..
c.s.	**Pervenetz** . .(iron)	3279	219	10	52	5	4½	4½	9¾	14	9	1	1067	6 8-in. 9-ton B.L.R., 6 6-in. 4-ton do., 5 M., 4 l.	..	1863	..	9·00	..	..
a.c.	**Rurik** . . (steel)	10,600	396	6	67	0	10	..	..	26	0	2	15000	4 8-in. 13½-ton B.L.R., 16 6-in. 6-ton do.	5 f. tu. or l. car	Building at Baltic Works.		18·00	..	..
c.s., t.	**Rusalka** . . .(iron)	2026	206	9	42	7	4½	6 turret	17½	12	9	2	786	4 9-in. 15-ton B.L.R., 2 M. .	..	1867	..	8·00	250	..
c.s., br.	**Sevastopol**‡ . (wood)	6210	295	0	52	0	4½	4½	..	25	6	1	3090	10 8-in. 9 ton. B.L.R. . .	..	1863	..	12·00	..	..
b.	**Sinope**, B.S. (iron & steel)	10,181	331	0	69	0	16	14 barbette	12-in. 13-in. steel dk.	27	1	2	13000	6 12-in. 50-ton B.L.R., 7 6-in. 6-ton do., 16 Q.F.	7 f. tu. or l.car	1887	900,000	16·75	886	1350 at 14 kts.
a.g.b.	**Sistovo**, B.S. . .(iron)	384	105	0	30	10	3	..	9¾	5	11	2	250	..	..	1868	..	8·00	..	..
c.s., t.	**Smertch** . . .(iron)	1520	187	0	39	4	4½	6 turret	7¾	11	6	2	700	2 9-in. 15-ton B.L.R., 1 M. .	..	1864	..	8·00	250	..
„	**Streletz** . . .(iron)	1431	200	0	45	11	5 1-in. plates	11 1-in. plates	39	11	6	1	444	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
b.	**Tchesmé**, B.S.. (iron & steel)	10,181	331	0	69	0	16	14 barbette	12-in. 3-in. steel dk.	27	1	2	11000	6 12-in. (50 ton) B.L.R., 7 6-in. 6-ton do., 16 Q.F.	7 f. tu. or l.car	1886	900,000	16·00	886	1350 at 14 kts.
c.s., t.	**Tifun** . . .(iron)	1666	200	0	45	11	5 1-in. plates	11 1-in. plates	39	12	5	1	453	2 9-in. 15-ton B.L.R., 1 M. .	..	1864	..	6·00	..	..
„	**Uragan** . . .(iron)	1415	200	0	45	11	5 1-in. plates	11 1-in. plates	39	11	6	1	432	2 9-in 15-ton B.L.R. . .	..	1864	..	6·00	..	..
circular c.s.	**Vice-Admiral Popoff**, (iron, copper sheathed) B.S.	3590	120	0	120	0	16	16 tower	9	13	5	6	3066	2 12-in. 40-ton B.L.R., 6 l. .	..	1875	..	6·00	250	..
c.s., t.	**Veshtchun** . .(iron)	1448	200	0	45	11	5 1-in. plates	11 1-in. plates	39	11	6	1	529	2 9-in. 15-ton B.L.R. . .	..	1864	..	6·00	..	..
a.c.	**Vladimir Monomach** (steel, copper sheathed)	5796	296	6	52	0	6 comp.	unarmoured	..	24	11	2	7000	4 8-in. 13-ton B.L.R., 12 6-in. 4-ton do., 4 M., 4 l.	2 f. tu. or l.car	1882	..	15·40	400	..

* Hughes Backing.

‡ These ships are now employed for harbour service.

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RUSSIA.—Unarmoured Ships.

(Bal., Baltic Fleet; B.S., Black Sea Fleet; Sib., Siberian Squadron.)

corv., corvette; *cr.*, cruiser; *d.v.*, despatch vessel; *g.v.*, gun-vessel; *to.cr.*, torpedo cruiser; *sl.*, sloop; P, deck protected throughout; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

On the Russian List are the names of a large number of vessels which cannot be classified on the principles adopted in the British Navy. Many, though used for practically civil purposes, would be available for service of some kind in war. In the following Table steamers, with guns, of over 300 tons are included, and are designated despatch vessels (*d.v.*), or gun-vessels (*g.v.*).

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
sl.	**Abrek**, Sib.	1069	193 6	29 6	wood	13 1	1	1109	3 6-in. B.L.R., 1 M., 2 l.	..	1860	..	..	..	..
cr. P.	**Admiral Korniloff**, Bal. (2½ steel deck).	5000	350 0	48 6	steel & wood sheathed	23 0	2	8260	14 6-in. 6-ton B.L.R., 16 Q.F.	6 f. tu. or l.car	1887	296,000	19·00	..	..
corv.	**Afrika**, Bal.	2852	285 5	39 4	iron	17 1	1	1350	3 6-in. 4-ton B.L.R., 4 M., 7 l.	..	1877	..	13·00	..	..
cr.	**Aleüt**, Sib. (Mining Transport)	810	150 0	31 0	steel	12 7	1	730	.. ..	..	1886	24,000	..	..	..
„	**Asia**, Bal.	2483	269 0	36 0	iron	16 5	1	1100	4 6-in. 4-ton B.L.R., 6 M., 5 l.	..	1878	..	12·00	..	..
„	**Askold**, Bal.	2245	216 6	39 4	wood	20 4	1	910	8 6-in. 4-ton B.L.R., 5 M., 5 l.	..	1863	..	9·00	..	..
„	**Bayan**, Bal.	1998	206 9	36 0	„	18 4	1	978	4 6-in. 4-ton B.L.R., 2 M., 5 l.	..	1857	..	10·00	..	..
g.v.	**Bobr**, Sib.	950	187 0	35 2	steel	10 10	2	1000	1 9-in. 15-ton B.L.R., 1 6-in. 4-ton do., 4 M., 6 l.	..	1884	43,000	14·00	..	..
corv.	**Bogatyr**, Bal. (Dismantled)	2204	213 3	39 4	wood	19 4	1	991	8 6-in. 4-ton B.L.R., 1 M., 4 l.	..	1860	..	9·00	..	..
g.v.	**Bombory**, B.S.	760	160 9	26 3	„	14 5	1	230	2 small guns	..	1852	..	..	..	..
to.cr.	**Captain Sacken**, B.S.	600	230 0	24 0	steel	8 10	2	3500	10 Q.F.	..	1888	40,700	20·00	..	..
g.v.	**Chernomoretz**, B.S.	1200	210 0	35 0	steel	10 0	1	2000	2 8-in. B.L.R., 1 6-in. do., 6 Q.F., 4 M.	2 f. tu. or l.car	1889	40,000	..	..	..
g.v.	Four new vessels, B.S	1200	210 0	35 0	steel	10 0	1	2000	2 8-in. B.L.R., 1 6-in. do., 6 Q.F., 4 M.	..	Bldg.	..	..	..	..
„	**Coreetz**, Sib.,	1200	210 0	35 0	steel	10 0	2	2000	2 8-in. B.L.R., 1 6-in. do., 6 Q.F.	2 f. tu. or l.car	1886	..	..	..	..
corv.	**Djigit**, Bal.	1456	206 9	32 10	iron & wood	16 1	1	1383	3 6-in. 4-ton B.L.R., 4 M., 4 l.	..	1876	..	12·50	..	..
g.v.	**Don**, B.S.	354	131 3	26 0	steel & wood sheathed	10 2	1	80 (nom.)	2 small guns	..	1856	..	..	..	..
„	**Donetz**, B.S.	1200	210 0	35 0	steel	10 0	1	2000	2 8-in. B.L.R., 1 6-in. do., 2 Q.F., 4 M.	2 f. tu. or l.car	1887	40,000	..	..	..

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„	**Gonez**, B.S. (Torpedo School)	745	173	10	26	0	iron	12	5	1	160 (nom.)	2 small guns	..	..	..	..	..	..
g.v.	**Gornostai**, Sib. (Dismantled)	456	147	7	22	11	wood	8	3	1	150	6 guns	..	1863	..	..	..	..
g.v.	**Ingul**, B.S.	745	173	10	32	10	iron	12	5	1	469	2 guns	..	1872	..	..	..	..
corv.	**Jemtchug**, Bal. . .	1781	239	6	29	6	iron	17	4	1	1438	3 6-in. 4-ton B L.R., 6 M., 4 l. . .	2 f. tu. or l.car	1861	..	..	..	..
g.v.	**Jermak**, Sib.	706	154	3	26	3	iron	11	2	1	125	2 guns	..	1870	..	..	..	..
„	**Kasbeck**, B.S. . .	692	167	4	26	3	„	11	2	1	280	2 small guns	..	1854	..	..	..	..
tr.cr.	**Kazarsky**, B.S. . .	400	190	4	24	4	steel	..		2	..	.. ..	..	1890	31,500	21·0	..	..
„	**Kelasurz**, B.S. . .	307	121	4	19	7	wood	10	5	1	246	4 small guns	..	1859	..	..	..	..
corv.	**Kreyzer**, Bal. . .	1542	206	9	32	10	iron & wood	16	1	1	1205	3 6-in. 4-ton B.L.R., 1 M., 4 l. . .	..	1875	..	13·00	..	..
g.v.	**Kubanetz**, B.S. . .	1200	210	0	35	0	steel	10	0	1	2000	2 8-in. 10-ton B.L.R., 1 6-in. do., 6 Q.F.	3 f. tu. or l.car	1888	40,000	..	..	..
to.cr.	**Lieutenant Ilyn**, Bal. .	600	230	0	24	0	steel	8	10	2	3500	19 Q.F.	8 f. tu. or l.car	1887	40,150	20·10	97	..
„	**Mandjur**, Bal. . .	1200	210	0	35	0	steel	10	0	2	2000	2 8-in. B.L.R., 1 6-in. do., 6 Q.F. . .	2 f. tu. or l.car	1886	..	13·00	..	..
g.v.	**Morz**, Sib. (Dismantled)	456	147	7	22	11	wood	8	3	1	150	7 guns	..	1860	..	..	..	..
corv.	**Nayezdnik**, Bal. . .	1334	206	9	32	10	composite	14	9	1	1719	3 6-in. 4-ton B.L.R., 5 M., 4 l. . .	..	1878	..	13·00	..	..
g.v.	**Nerpa**, Sib (Dismantled)	379	124	7	22	11	wood	7	10	1	60 (nom.)	5 guns	..	1860	..	..	..	..
corv.	**Oprichnik**, Bal. . .	1426	206	9	32	10	composite	16	0	1	1685	4 6-in. 4-ton B.L.R., 6 M., 2 l. . .	..	1880	..	13·00	..	..
cr.	**Pamyat Merkuriya**, B.S.	3050	292	0	39	4	iron & steel	19	7	1	800	4 18-ton B.L.R., 4 4-in. do. . . .	2 f. tu. or l.car.	1880	..	14·00	..	..
d.v.	**Penderaklia**, B.S. . .	1052	190	3	29	6	iron	12	8	1	568	3 guns	..	1877	..	..	..	..
g.v.	**Pitsunda**, B.S. . .	335	137	11	19	7	wood	9	7	1	572	3 small guns	..	1857	..	..	..	..
sl.	**Plastun**, Bal. . .	1255	206	9	32	10	composite	14	1	1	1543	3 6-in. 4-ton B.L.R., 6 Q.F., 5 l. . .	..	1879	..	12·00	..	..
g.v.	**Prut**, B.S. . . .	339	154	3	23	0	iron	7	3	1	327	2 guns	..	1849	..	..	..	..
„	**Psezuappé**, B.S. . .	335	127	11	19	7	„	10	5	1	216	4 small guns	..	1857	..	..	..	..
corv.	**Razboynik**, Bal. . .	1329	206	9	32	10	iron & wood	14	9	1	1786	3 6-in. 4-ton B.L.R., 6 M., 4 l. . .	..	1878	125,000	12·00	..	..
cr. P.	**Rynda**, Bal. (1½ inch steel deck.)	2950	265	9	45	11	steel & wood sheathed.	16	1	2	3600	10 6-in. 4-ton B.L.R., 6 M., 4 l. . .	2 f. tu. or l.car	1885	..	*15·00	710	2400
g.v.	**Salgir**, B.S. . . .	360	131	3	23	0	wood	10	5	1	107	.. ..	..	1857	..	..	..	..
„	**Sivootch**, Sib. . . .	950	187	0	33	2	steel	10	10	2	1000	1 9-in. 15-ton B.L.R., 1 6-in. 4-ton do., 4 M., 6 l.	..	1884	43,000	14·00	..	..

* The actual speed of this vessel has not exceeded 13 knots.

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RUSSIA.—Unarmoured Ships—*continued.*

(Bal., Baltic Fleet; B.S., Black Sea Fleet; Sib., Siberian Squadron.)

corv., corvette; *cr.*, cruiser; *d.v.*, despatch vessel; *g.v.*, gun-vessel; *sl.*, sloop; *t. b. c.*, torpedo boat-catcher; P., deck protected throughout; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	**Skobeleff**, Bal. . .	2397	216 6	39 4	wood	19 0	1	1042	4 6-in. 4-ton B.L.R., 3 Q.F., 4 l. . .	..	1862	..	9·00	..	..
g.v.	**Sobol**, Sib. (Dismantled)	456	147 7	22 11	„	8 3	1	150	12 6-in. & 2 light guns . . .	..	1863	..	..	..	..
sl.	**Sokol**, B.S. (Dismantled)	1057	160 9	32 10	„	15 5	1	346	1 6-in. 4-ton B.L.R., 1 M., 8 l. . .	..	1859	..	..	..	..
g.v.	**Souk-Su**, B.S.. . .	307	121 4	19 8	„	10 5	1	317	3 guns	..	1859	..	..	..	..
corv.	**Strjelok**, Bal. . . .	1343	206 9	32 10	composite	14 2	1	1528	3 6-in. 4-ton B.L.R., 4 M., 4 l. . .	..	1880	..	13·00	..	..
fr.cr.	**Svjetlana**, Bal. . .	3200	223 2	49 3	wood	22 4	1	1113	6 8-in. 9 ton B.L.R., 6 6-in. 4-ton do., 7 M., 5 l.	..	1858	..	10·00	..	..
g.v.	**Tamanj**, B.S. . . .	551	173 10	25 11	iron	9 7	1	745	2 guns	..	1849	..	..	..	..
„	**Teretz**, B.S. . . .	1200	210 0	35 0	steel	10 0	..	2000	3 9-in. 12-ton B.L.R., 1 6-in. do., 2 Q.F., 4 M.	2 f. tu. or l.car	1888	40,000	..	..	..
„	**Tunguz**, Sib. . . .	706	154 3	26 3	iron	11 2	1	130	4 guns	..	1870	..	..	..	..
„	**Turok**, B.S. . . .	537	134 6	24 11	wood	11 2	1	422	2 guns	..	1846	..	..	..	..
„	**Uraletz**, B.S. . . .	1200	210 0	35 0	steel	10 0	..	2000	3 9-in. 12-ton B.L.R., 1 6-in. do., 2 Q.F., 4 M.	3 f. tu. or l.car	1888	40,000	..	..	..
cr. P.	**Vitiaz**, Bal. (1½ steel dk.).	2950	265 9	45 11	steel & wood sheathed.	16 1	2	3000	10 6-in. 4 ton B.L.R., 9 Q.F., 4 l. . .	2 f. tu. or l.car	1884	125,000	*15·00	710	2400
sl.	**Vjestnik**, Bal. . .	1255	206 9	32 10	iron & wood sheathed.	14 2	1	1268	3 6-in. 4 ton B.L.R., 4 M., 4 l. . .	..	1879	..	12·00	..	..
corv.	**Voyin**, B.S. (Dismantled)	1652	183 9	39 4	wood	17 4	1	875	1 8-in. B.L.R., 5 6-in. do., 3 M., 4 l. .	..	1858	..	..	..	..
sl.	**Zabiyaka**, Bal. . .	1234	219 10	29 6	iron	14 9	1	1470	2 6-in. 4-ton B.L.R., 4 M., 5 l. . .	..	1878	..	14·00	..	..
g.v.	**Zaporojets**, B.S. . .	1200	210 0	35 0	steel	10 0	2	1500	3 9-in. 12 ton B.L.R., 11 6-in. do., 2 Q.F., 4 M.	2 f. tu. or l.car	1887	40,000	..	..	..

* The actual speed of this vessel has not exceeded 13 knots.

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Besides the ships and vessels given in the alphabetical list there are a large number of small steamers, two corvettes, Varyag and Voivoda; one cruiser, Europa; two gun-vessels, Gaidamak and Izomrod, and two gunboats, Kartetch and Otliv, used for harbour service only.

Gunboats, Staunch class (*Baltic Fleet*).—Boorya, Bouroun, Dojd, Grad, Groza, Meena, Snieg, Tutcha, Vikhr, Yersh (258 to 402 tons, 195 to 472 I.HP., 1 11-inch B.L.R.).

Gunboats (*Baltic Fleet*).—Korsun, 191 tons, and Shtcheet, 240 tons.

Steamers (*Gun vessels, Despatch vessels, &c.*) (*Black Sea Fleet*).—Abin, Ablanova, Batjuska, Bogot, Boltun, Brate, Brestovitz, Matushka, Redoot-kali, Rodeemai, Sestritsa, Taman, Tuabse (90 to 298 tons).

Steamer (*Siberian Squadron*).—Amur (190 tons).

Also yachts, training ships, paddle steamers, and the Caspian and Lake Aral Flotillas of small vessels. Among the yachts is the circular ship Opuit, formerly the Livadia, now fitted for transport work.

Torpedo boats, Baltic (*First Class*).—Eleven, from 100 feet to 152 feet long, 100 to 134 tons displacement, a speed of 20 knots, armed with two machine guns and two to four launching tubes. Twenty-one of 100 to 130 feet long, 40 to 90 tons displacement, and speed of 17 to 22 knots; armed with two to four machine guns and two bow tubes.

Second Class.—Eighty-seven of from 60 to 80 feet long, 24 tons displacement, and 17 knots speed.

Black Sea (*First Class*).—Twelve.

At the Schichau Works, two torpedo boats 152 ft. 6 in. long by 16 ft. 9 in., speed 26½ knots, are being built at cost of £15,200 each, for the Black Sea.

At Crichton's Works, Abo, Finland, two torpedo boats 152 ft. 3 in. long, 16 ft. 3 in. broad, and speed 22 knots, at a cost for the two of £34,580, for the Baltic.

Two (first-class) torpedo boats have been ordered at the Belino Henderikh Works, Odessa. Length, 126 feet; breadth, 14 feet 8 inches; draught of water, 3 ft. 8 in.; displacement, 81 tons; I.HP., 1100; speed, 21 knots. They are to be completed by June, 1892.

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Auxiliary Steamers.

Class.	NAME.	Material built of.	Where built.	When built.	Length.	Breadth.	Depth of Water.	Displacement.	Horse-power of Engines.	No. of Screws.	
	BLACK SEA CO.				ft. in.	ft. in.	ft. in.	tons.			
Auxiliary Cruiser	Argonaut	..	..	..	..	..	..	..	..	..	
,,	Czar	steel	Newcastle	1883	319 0	37 0	23 6	2240	350 nom.	1	
,,	Czarevna	,,	,,	1883	319 0	37 0	23 6	2240	350 nom.	1	
,,	Czaritza	,,	,,	1883	319 0	37 0	23 6	2240	350 nom.	1	
,,	Grand Duke Alexei. . .	,,	,,	1890	440 0	..	..	..	..	..	
,,	Grand Duke Constantine .	,,	,,	1890	440 0	..	..	..	..	..	
	VOLUNTEER FLEET.										
,,	Aryol (said to steam 19 knots) .	..	,,	..	..	..	..	..	..	..	Delivered at Odessa, March 1890.
,,	Kostroma	iron	Glasgow	1873	372 0	36 0	..	3030	..	..	
,,	Moskva (was Kinfauns Castle) .	,,	,,	1879	360 0	43 0	..	3050	2730	1	
,, (*a*)	Nijni Novgorod (was Saxonia) .	,,	Greenock	1857	321 0	40 0	..	2670	300 nom.	1	
,,	St. Petersburg (was Thuringia) .	,,	,,	1870	340 0	41 0	..	3050	2600	1	
,,	Russia (was Holsatia) . .	,,	,,	1868	341 0	40 0	21 0	3100	2200	1	
,,	Vladivostock	,,	Renfrew	1880	324 0	29 0	..	1200	..	1	
,, (*a*)	Yaroslav	,,	La Seyne	1880	295 0	41 0	..	2350	3000	1	

(*a*) Coast service only (Black Sea).

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SARAWAK.

Gunboat.—Aline: length 242 ft. 6 in.; beam, 21 ft. 3 in.; tonnage, 175; 35 nom. HP.; 2 guns; launched 1875. Lorna Doone; length, 103 ft. 4 in.; beam, 17 ft. 2 in.; tonnage, 118; 40 nom. HP. 2 guns; launched 1881.

Paddle steamer, Aden, Three armed launches (50 to 100 tons).

SIAM.—Unarmoured Ships.

Two corvettes (1000 tons, 8 guns); three gun-vessels; two gun-boats; yachts, and small craft.

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SPAIN.—Armoured Ships.

a.g.b., armoured gunboat; *b.*, barbette ship; *br.*, broadside ship; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Battery.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
a.c.	Almirante Oquendo	7000	340 0	65 0	12	10½ barbette. 12 conning tower.	steel dk. 2 ins. & 3 ins. slopes.	21 6	2	13,000	2 28-c.m. B.L.R., 10 14-c.m. do. (all Hontoria), 8 57-m.m. Q.F., and 8 37-m.m. do.	8 f. tu. or l.car	Bldg.	600,000	20·00	..	..
„	Cataluna . . .	7000	340 0	65 0	12	10½ barbette. 12 conning tower.	steel dk. 2 ins. & slopes 3 ins.	21 6	2	13,000	2 28-c.m. B.L.R., 10 14-c.m. do. (all Hontoria), 8 57-m.m. Q.F., 8 37-m.m. do., 8 M.	8 f tu. or l.car	1890	600,000	20·00	..	..
„	Cisnerso . . .	7000	340 0	65 0	12	10½ barbette. 12 conning tower.	steel dk. 2 ins. & slopes 3 ins.	21 6	2	13,000	2 28-c.m. B.L.R., 10 14-c.m. do. (all Hontoria), 8 57-m.m. Q.F., 8 37-m.m. do., 8 M.	8 f. tu. or l.car	1890	600,000	20·00	..	..
a.g.b.	Duque de Tetuan (Harbour Service) (iron)	703	141 0	31 2	4	4	9	6 10	2	190	1 16-c.m. (Parrot), 4 bronze smooth-bores.	..	1874	..	..	23	..
a.c.	Infanta Maria Teresa (steel)	7000	340 0	65 0	12	10½ barbette. 12 conning tower.	steel dk. 2 ins. & slopes 3 ins.	21 6	2	13,000	2 28-c.m. B.L.R., 10 14-c.m. do. (all Hontoria), 8 57-m.m. Q.F., 8 37-m.m. do., 8 M.	8 f. tu. or l.car	1890	600,000	20·00	..	..

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br.	**Numancia**	(iron)	7305	314	10	55	9	5½	5	12	25	3	1	3708	8 10-in. M.L.R. (Armstrong), 7 8-in. do., 2 M., 8 l.	..	1863	315,600	8·00	740	2450
b.	**Pelayo**	(steel)	9900	330	0	66	0	17¾	19½ barbette.	..	24	11	2	8000	2 32-c.m. 48-ton B.L.R., 2 28-c.m. 38-ton B.L.R., 1 16-c.m. do., 12 12-c.m. do., 14 M.	7 f. tu. or l.car	1887	..	16·00	700	..
a.c.	**Princesa de Asturias**	(steel)	7000	340	0	65	0	12	10½ barbette. 12 conning tower.	steel dk. 2 ins. & slopes 3 ins.	21	6	2	13,000	2 28-c.m. B.L.R., 10 14-c.m. do. (all Hontoria), 8 57-m.m. Q.F., 8 37-m.m. do., 8 M.	8 f. tu. or l.car	Bldg.	600,000	20·00	..	..
c.s., t.	**Puig-cerda** (Harbour Service)	(iron Monitor)	553	127	11	29	6	4	4	9	6	7	2	328	2 16-c.m. bronze smoothbores, 1 16-c.m. B.L.R. (Palliser).	..	1874	..	8·00	23	..
br.	**Sagunto** (Harbour Service)	(wood)	7352	292	0	55	10	6	6	24	30	1	1	3700	8 9-in. 13-ton M.L.R. (Armstrong), 3 18-c.m. (Palliser), 2 M., 8 l.	..	1869	..	8·00	900	..
a.c.	**Vizcaya**		7000	340	0	65	0	12	10½ barbette. 12 conning tower.	steel dk. 2 ins. & slopes 3 ins.	21	6	2	13,000	2 28-c.m. B.L.R., 10 14-c.m. do. (all Hontoria), 8 57-m.m. Q.F., and 8 37-m.m. do.	8 f. tu. or l.car	Bldg.	600,000	20.00	..	..
b.r.	**Vitoria**	(iron)	7250	318	3	55	10	5½	5	12	25	3	1	4500	8 9-in. 13-ton M.L.R. (Armstrong), 3 8-in. do., 2 M., 6 l.	2 f. tu. or l.car	1865	..	11·00	900	..
„	**Zaragoza**	(wood).	5620	278	10	55	10	5	5	26	24	7	1	3000	4 9-in. 13-ton M.L.R. (Armstrong), 3 18-c.m. (Palliser), 8 16-c.m. do., 2 M., 7 l.	..	1867	..	8·00	700	..

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SPAIN.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *d.v.*, despatch-vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; *pp.*, partial deck protected; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
d.v.	**Africa**	629	157 5	23 3	wood	15 3	1	280	2 12-c.m. bronze smooth-bores . .	..	1862	..	7·00	120	..
cr.	**Alfonso XII.** . . .	3090	278 10	42 7	steel	16 5	1	4800	8 16-c.m. B.L.R. (Hontoria), 4 9-c.m. do., 2 M., 2 l.	6 f. tu. or l.car	1887	..	17·50	600	..
cr.	**Alfonso XIII.** . . P.	5000	318 6	50 6	steel	20 0	2	11,000	4 24-c.m. B.L.R., 6 12-c.m. do., 8 Q.F., 8 M.	5 f. tu. or l.car	Bldg.	..	20·00	1100	..
fr.cr.	**Almanza** (Surveying ship) .	3960	275 7	49 3	wood	20 11	1	600 (nom.)	22 16-c.m. M.L.R. (Palliser), 2 M., 6 l. .	..	1864	..	7·00	650	..
g.v.	**Animosa** (for Colonial Guard ship)	510	150 11	26 3	iron	7 7	1	100 (nom.)	1 16-c.m. 6-ton M.L.R. (Palliser), 1 12-c.m. bronze smooth-bore, 2 l.	..	1860	..	8·00	..	..
cr.	**Aragon**	3342	246 0	45 11	wood	20 11	1	4400	8 16-c.m. B.L.R. (Hontoria), 2 8·7-c.m. do. (Krupp), 4 l., 2 M.	..	1879	..	14·00	470	..
g.v.	**Audaz**	600	190 0	23 0	steel	10 4	2	2600	2 12-c.m. B.L.R. (Hontoria), 4 Q.F., 1 M. .	2 l.car.	1889	..	18·0	106	..
g.v.	**Bazan**	757	164 0	24 7	iron	10 10	2	739	1 13-c.m. M.L.R. (Parrot), 1 12-c.m. bronze smooth-bore.	..	1873	..	10·00	..	..
fr.cr.	**Blanca** (for Colonial Guard ship)	2452	209 11	42 7	wood	18 4	1	360 (nom.)	12 20-c.m. smooth-bores, 4 16-c.m. do., 4 l.	..	1859	..	8·00	300	..
fr.cr.	**Carmen** (for Colonial Guard ship)	3116	242 9	45 11	wood	19 7	1	600 (nom.)	16 20-c.m. smooth-bores, 4 16-c.m. do., 4 l.	..	1861	..	8·00	460	..
cr.	**Castilla**	3342	246 0	45 11	wood	20 11	1	4400	8 15-c.m. B.L.R. (Krupp), 4 9-c.m. do. (Hontoria), 2 M., 2 l.	..	1881	..	14·00	470	..
„	**Concha**	524	157 5	25 7	iron	8 7	2	600	3 12-c.m. B.L.R. (Hontoria), 2 M. . .	2 f. tu. or l.car	1885	..	11·50	80	..
fr.cr.	**Concepcion** (for Colonial Guard ship)	3210	229 7	45 11	wood	20 1	1	2100	5 16-c.m. M.L.R., 16 20-c.m. smooth-bores, 4 l.	..	1860	..	8·00	360	..

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cr.	**Conde de Venadito** . .		1130	210	0	32	0	iron	12	6	1	1600	2 4⅔-in. B.L.R., 2 3-½in. do., 5 M. . .	2 f. tu. or l.car	1888	..	14·00	220	..
„	**Cristobel Colon** . .		1130	210	0	32	0	iron	12	6	1	1600	3 6-in. B.L.R., 2 3½-in. do., 5 M. . .	2 f. tu. or l.car	1887	..	14·00	220	..
„	**Don Antonio Ulloa** . .		1130	210	0	32	0	iron	12	6	1	1600	3 6-in. B.L.R., 2 3½-in. do., 5 M. . .	2 f. tu. or l.car	1887	..	14·00	220	..
„	**Don Juan de Austria** .		1130	210	0	32	0	iron	12	6	1	1600	3 6-in. B.L.R., 2 3½-in. do., 5 M. . .	2 f. tu. or l.car	1887	..	14·00	..	..
to.g.b.	**Destructor** . . .		458	192	6	25	0	steel	mean dt. 7	0	2	3800	1 9-c.m. B.L.R., 4 6-pr. Q.F., 4 M. . .	3 f. tu. or l.car	1887	..	22·56	..	5500
g.v.	**El Cano**		524	157	5	25	7	iron	8	6	2	600	3 12-c.m. B.L.R. (Hontoria), 2 M. . .	or l.car	1885	..	11·50	80	..
cr.	**Ensenada** . . .	*pp.*	1030	185	0	30	0	steel	11	6	2	1600	6 12-c.m. B.L.R. (Hontoria), 4 M. . .	3 f. tu. or l.car	1890	..	15·00	..	..
g.v.	**Galicia**		600	190	0	23	0	steel	10	4	2	2600	2 12-c.m. B.L.R. (Hontoria), 4 Q.F., 1 M. .	2 l.car.	Bldg.	..	18·0	106	..
d.v.	**Fernando el Catolico** .		500	157	5	25	7	iron	8	5	2	550	1 16-c.m. M.L.R. (Palliser), 2 12-c.m. smooth-bores, 1 M.	..	1875	..	10·00	20	..
g.v.	**General Lezo** . . .		524	157	5	25	7	iron	8	6	2	600	3 12-c.m. B.L.R. (Hontoria), 2 M. . .	1 f. tu. or l.car	1885	..	11·00	80	..
fr.cr.	**Gerona**		3980	265	9	49	3	wood	20	8	1	600 (nom.)	21 smooth-bores, 2 l.	..	1864	..	9·00	675	..
sl.	**Infanta Isabel** . . .		1130	210	11	32	2	iron	12	5	2	1500	5 12-c.m. B.L.R. (Hontoria), 5 M., 2 l. .	..	1885	..	14·00	220	..
sl.	**Isabel II.**		1130	210	11	32	2	iron	12	5	2	1500	5 12-c.m. B.L.R. (Hontoria), 5 M., 2 l. .	..	1886	..	14·00	220	..
cr.	**Isla de Cuba** . .	*pp.*	1030	185	0	30	0	steel	11	6	2	2200	6 4-¾in. B.L.R., 4 6-pdr. Q.F. . . .	3 f. tu. or l.car	1887	..	16·00	160	..
„	**Isla de Luzon** . .	*pp.*	1030	185	0	30	0	steel	11	6	2	2200	6 4⅔-in. B.L.R., 4 6-pdr. Q.F. . . .	3 f. tu. or l.car	1887	..	16·00	160	..
„	**Jorge Juan** . . .		935	203	5	29	6	wood	12	2	1	1100	3 16-c.m. 6-ton M.L.R. (Palliser), 2 M., 2 l.	..	1876	..	13·00	130	..
„	**Lepanto** . . .	P.	5000	318	6	50	6	steel	20	0	2	11,000	4 24-c.m. B.L.R., 6 12-c.m. do., 8 Q.F., 8 M.	5 f. tu. or l.car	Bldg.	..	20·00	1100	..
g.v.	**Ligera**		445	147	7	23	7	wood	8	10	1	393	2 16-c.m. M.L.R., 1 12-c.m. smooth-bore, 1 l.	..	1864	..	7·00	180	..
„	**Magellanes** . . .		524	157	5	25	7	iron	8	6	2	600	3 12-c.m. B.L.R. (Hontoria), 2 M. . .	..	1885	..	11·00	80	..
d.v.	**Marques del Duero** . .		500	157	5	25	7	iron	8	5	2	550	1 16-c.m. M.L.R. (Palliser), 2 12-c.m. smooth-bores, 1 M.	..	1875	..	10·00	90	..
cr.	**Navarra**		3342	232	11	42	7	wood	20	4	1	4400	8 16-c.m. B.L.R. (Hontoria), 2 8·7-c.m. do. (Krupp), 2 M., 4 l.	..	1881	..	13·00	470	..

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SPAIN.—Unarmoured Ships—*continued.*

corv., corvette; *cr.*, cruiser; *d.v.*, despatch-vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *to.g.b.*, torpedo gun-boat; P, deck protected throughout; *pp.*, partial deck protected; f. tu., l. car., fixed tube or launching carriage for Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
fr.cr.	**Navas de Tolosa** . .	4460	265 9	49 3	wood	22 4	1	600 (nom.)	22 16-c.m. M.L.R. (Palliser), 4 16-c.m. smooth-bores, 4 l.	..	1865	..	7·00	670	..
g.v.	**Nueva Espana** . . .	600	190 0	23 0	steel	10 4	2	2600	2 12-c.m. B.L.R. (Hontoria), 4 Q.F., 1 M. .	2 l. car.	1889	..	18·00	106	..
,,	**Prosperidad** . . .	420	141 0	22 7	wood	9 7	1	134	2 16-c.m. smooth-bores, 1 M., 1 l. . .	..	1865	..	6·00	80	..
,,	**Rapido**	600	190 0	23 0	steel	10 4	2	2600	2 12-c.m. B.L.R. (Hontoria), 4 Q.F., 1 M. .	2 l. car.	Bldg.	..	18·00	106	..
cr.	**Reina Christina** . .	3090	278 10	42 7	steel	16 5	1	4800	8 16-c.m. B.L.R. (Hontoria), 4 9-c.m. do., 2 M., 2 l.	5 f. tu. or l.car	1886	..	17·50	600	..
,,	**Reina Mercedes** . .	3090	278 10	42 7	steel	16 5	1	4860	8 16-c.m. B.L.R. (Hontoria), 4 9-c.m. do., 2 M., 2 l.	5 f. tu. or l.car	1887	..	17·50	600	..
,,	**Reina Regente** . . P.	5000	318 6	50 6	steel	20 0	2	11,000	4 24-c.m. 21-ton B.L.R., 6 12-c.m.do., 8 Q.F., 8 M.	5 f. tu. or l.car	1887	..	20·70	1100	..
sl.	**Sanchez Barcaistegui** .	935	203 5	29 6	wood	12 2	1	1100	3 16-c6.m. -ton M.L.R. (Palliser), 2 M., 2 l.	..	1876	..	13·00	130	..
d.v.	**San Quentin** . . .	1300	246 0	32 10	iron	11 6	1	1500	3 12-c.m. B.L.R. (Hontoria), 1 M., 2 l. . .	..	1856	..	10·00	360	..
g.v.	**Sirena**	445	147 7	22 11	wood	9 6	1	227	1 16-c.m. M.L.R. (Palliser), 2 12-c.m. smooth-bores, 2 l.	..	1863	..	8·00	95	..
,,	**Temerario**	600	190 0	23 0	steel	10 4	2	2600	2 12-c.m. B.L.R. (Hontoria), 4 Q.F., 1 M. .	2 f. tu. or l. car	1889	..	18·00	106	..
corv.	**Tornado** (Torpedo School ship)	2090	219 10	32 10	composite	14 5	1	328 (nom.)	2 16-c.m. M.R.L. (Palliser), 2 12-c.m. smooth-bores, 2 l.	..	1866	..	9·00	350	..
to.g.b.	Torpedo Gunboats (four vessels)	600	..	..	..	..	..	..	.. .. ..	..	Bldg.	..	..	..	..
g.v.	**Valiente**	733	150 1	25 11	iron	7 10	1	380	1 16-c.m. M.R.L. (Palliser) 1 12-c.m. smooth-bore, 2 l.	..	1860	..	7·00	130	..
sl.	**Velasco**	1152	209 11	29 3	iron	12 5	1	1500	3 15-c.m. 4-ton B.R.L. (Armstrong), 1 M., 2 l.	..	1881	..	14·30	220	..
g.v.	**Veloz**	600	190 0	23 0	steel	10 4	2	2600	2 12-c.m. B.L.R. (Hontoria), 4 Q.F., 1 M. .	2 l. car.	Bldg.	..	18·0	106	..

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Besides the ships and vessels in the alphabetical list there are the paddle-vessels, Ferrolano, Gaditano, Liniers, training ships and transports; also

Gunboats.—Alsedo, Cocodrillo, Cuba-Española, Eulalia, Pelicano, Pilar, Salamandra (216 to 245 tons, 199 to 240 I.HP.).

Small steamers, classed as third-class gunboats, forty-three in number (33 to 179 tons).

Torpedo-boats.—Six seagoing torpedo-boats of the Ariète type, of 135 feet in length, 108 tons displacement and 26·11 knots speed; two torpedo-boats of the Falke type, 108 tons displacement, 135 feet in length, and 23 knots; and twenty-eight other first-class boats built or building.

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SWEDEN.—Armoured Ships.

a.g.b., armoured gunboat; *c.s.*, coast-service vessel; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Turret.	Water-line.					Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
a.g.b.	Berserk . (iron)	452	131 3	29 6	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1874	..	8·00	19	..
„	Bjorn . (iron)	457	131 3	26 3	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1874	..	8·00	19	..
„	Fenris . (iron)	259	104 11	22 4	11	2	34	7 10	1	44	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1872	..	6·00	7	..
„	Folke . (iron)	460	131 3	26 3	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1875	..	8·00	19	..
„	Garmer . (iron)	268	91 10	22 11	6	2	8	7 7	1	90	1 27-c.m. 24-ton B.L.R., 2 M. .	..	1868	..	6·00	15	..
„	Gerda . (iron)	457	131 3	26 3	14	2½	34	8 3	2	133	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1873	..	8·00	19	..
t.	Gota . (steel)	3070	258 6	48 0	11½–9¾	11½–8	..	10 1	2	3100	2 10-in. 29-ton B.L.R., 4 6-in. do. .	1 f. tu. or l. car.	1890	..	15·50	200	..
t.	New ship unnamed (steel)	3070	258 6	48 0	11½–9¾	11½–8	..	10 1	2	3100	2 10 in. 29-ton B.L.R., 4 6-in. do. .	1 f. tu. or l. car.	Bldng	..	15·50	200	..
„	Hildur . (iron)	457	131 3	26 3	14	2½	34	8 3	2	133	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1872	..	8·00	19	..
c.s., t.	John Ericsson (iron)	1500	200 2	45 11	11	4½	31½	11 6	1	380	2 24-c.m. 15-ton B.L.R., 2 M. .	..	1865	..	6·00	112	..
„	Loke . (iron)	1600	205 3	45 11	18	4	40	11 10	1	430	2 24-c.m. 15-ton B.L.R., 3 M. .	..	1871	..	7·00	112	..
a.g.b.	Skold . (iron)	247	104 11	22 4	9	1	34	8 3	1	17	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1869	..	4·00	5	..
„	Sölve . (iron)	454	131 3	29 6	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1875	..	8·00	19	..
t.	Svea . (steel)	2900	249 4	49 3	11½	11½	11½	15 9	2	3100	2 10-in. 27-ton B.L.R. (Armstrong), 4 6-in. 4-ton do., 6 M.	6 f. tu. or l.car.	1886	127,300	15·45	200	800 at 12 knots.
c.s., t.	Thordon . (iron)	1500	200 2	45 11	11	4½	26	11 6	1	380	2 24-c.m. 15-ton B.L.R., 2 M. .	..	1866	..	6·00	112	..
„	Tirfing . (iron)	1500	200 2	45 11	11	4½	26	11 6	1	380	2 24-c.m. 15-ton B.L.R., 2 M. .	..	1867	..	6·00	112	..
a.g.b.	Ulf . . (iron)	457	131 3	26 3	14	2½	34	8 3	2	155	1 24-c.m. 15-ton B.L.R., 2 M. .	..	1873	18,000	8·00	20	..

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SWEDEN.—Unarmoured Ships.

corv., corvette; *fr. cr.*, frigate-built cruiser; *g.v.* gun-vessel; *tor. ship*, torpedo ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dis-chargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
corv.	**Balder**	1886	203 5	36 0	wood	18 4	1	1380	4 15-c.m. B.L.R. (Armstrong), 2 12-c.m. B.L.R., 6 M., 1 l.	..	1870	..	12·00	200	940
g.v.	**Blenda**	500	167 4	25 11	iron	9 2	2	590	1 27-c.m. 24-ton B.L.R. (Armstrong), 1 12-c.m. B.L.R., 2 M.	..	1875	..	12·00	98	..
„	**Disa**	500	167 4	25 11	„	9 2	2	590	1 27-c.m. 24-ton B.L.R. (Armstrong), 1 12 c.m. B.L.R., 2 M.	..	1877	..	12·00	98	..
tor. ship.	**Drott** (was Ran) (Torpedo vessel)	630	173 10	26 3	„	9 6	2	960	4 Engström, Q.F..	3 f. tu. or l.car	1877	..	13·00	100	1000
g.v.	**Edda**	640	180 5	27 3	„	9 6	2	960	1 27·4-c.m. 27-ton B.L.R., 1 15-c.m., do. 4 M.	..	1882	..	13·00	80	..
corv.	**Freja**	2000	216 6	39 4	steel & wood	18 9	1	1750	4 15-c.m. 4-ton B.L.R., 8 12-c.m. do., 8 M.	..	1885	..	12·00	180	..
g.v.	**Rota**	537	170 7	26 3	iron	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1878	..	13·00	80	..
corv.	**Saga** (School Ship) . .	1535	200 2	32 10	wood	17 1	1	900	1 15-c.m. 5-ton B.L.R. (Armstrong), 6 12-c.m. B.L.R, 4 M., 2 l.	..	1878	..	11·00	170	..
g.v.	**Skaggald**	537	170 7	26 3	iron	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1879	..	13·00	80	..
„	**Skagul**	537	170 7	26 3	„	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1878	..	13·00	80	..
„	**Skuld**	537	170 7	26 3	„	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1880	..	13·00	80	..
„	**Urd**	537	170 7	26 3	„	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1877	..	13·00	80	..
fr. cr.	**Vanadis**	2136	209 11	42 7	wood	20 1	1	1400	8 17-c.m. 5-ton B.L.R., 8 16-c.m. 3-ton shell guns, 4 M.	..	1862	..	11·00	235	..
g.v.	**Verdande**	537	170 7	26 3	iron	9 2	2	780	1 27-c.m. 24-ton B.L.R., 1 12-c.m. do., 2 M.	..	1879	..	13·00	80	..

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Gunboats.—Alfhild, Aslog, Astrid, Gunhild, Sigrid (180 to 200 tons, and about 130 I.HP.), each carrying 1 12-c.m. B.L.R. and 2 M.

Torpedo-boats—First-class: five of 65 tons and 19 knots speed, six other first-class boats of 40 tons displacement and 18 knots speed, one of 34 tons displacement and 16 knots speed, and seven other boats of smaller size and less speed.

The Swedish Navy has, besides the Torpedo School-vessel Ran, built of steel and of 175 tons displacement, 140 I.HP. and 10 knots speed, training ships, transports, surveying vessels, and some steamers of old construction.

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TURKEY.—Armoured Ships.

a.g.b., armoured gunboat; *br.*, broadside ship; *c.b.*, central-battery ship; *t.*, turret ship; f. tu., l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Turret or Battery.	Belt.					Guns.	Fish Torpedo Dischargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.b.	**Assar-i-Schefket** .(iron)	2080	203 5	42 7	4½	6	9	16 5	2	1750	5 8-in. 7-ton M.L.R. (Armstrong), 2 l., 5 M.	..	1868	..	11·00	300	..
,,	**Assar-i-Tevfik** .(iron)	4687	272 4	52 6	6	8	9	24 11	1	3560	8 9-in. 12-ton M.L.R. (Armstrong), 5 l., 8 M.	..	1868	..	13·00	400	..
,,	**Avni-Illah** . . .(iron)	2400	226 4	36 0	5	6	10	16 5	1	2200	4 9-in. 13-ton M.L.R. (Armstrong), 1 12-c.m. K. B.L., 1 l., 6 M.	..	1869	..	12·00	220	..
br.	**Azazieh** . . .(iron)	6400	292 0	55 9	5	5½	9	25 7	1	3735	1 9-in. 12-ton M.L.R. (Armstrong), 17 8-in. 7-ton do., 8 M.	..	1864	..	13·00	750	..
c.b.	**Feth-i-Bulend** . .(iron)	2806	236 3	39 4	6	9	10	18 1	1	3250	4 9-in. 12-ton M.L.R. (Armstrong), 2 7-in. 6-ton do., 2 l., 6 M.	..	1869	..	13·00	300	..
a.g.b.	**Feth-el-Islam** . .(iron)	335	101 9	24 7	3	3	10	5 11	1	290	2 7-in. (Armstrong), 1 l. . . .	..	1864	..	8·00	20	..
c.b.	**Hamidieh** . . .(iron)	6700	292 0	55 9	5	9	18	24 10	1	6800	10 24-c.m. 13-ton B.L.R. (Krupp), 2 17-c.m. 6-ton do., 6 l., 2 M.	..	1885	..	13·00	600	..
a.g.b.	**Hisber** (was Nusritieh) (iron)	404	144 4	30 10	3	3	5½	5 7	1	400	2 15-c.m. B.L.R. (Krupp) . . .	..	1875	..	7·00	20	..
t.	**Hufzi-el-Rahman** .(iron)	2540	204 0	45 11	5	4½	10	14 5	1	200 nom.	2 9-in. 12-ton M.L.R. (Armstrong), 2 7-in. 6-ton do., 1 5-in. do., 6 M.	..	1868	..	12·00	200	..
c.b.	**Idjilalieh** . . .(iron)	2266	213 3	42 7	4·5	6	13	17 4	1	1800	2 9-in. 12½-ton M.L.R. (Armstrong), 3 7-in. 6-ton, 8 M.	..	1870	..	11·00	300	..
br.	**Mahmudieh** . .(iron)	6400	292 0	55 9	5	5½	9	25 7	1	3735	1 9-in. 12-ton M.L.R. (Armstrong), 17 8-in. 6-ton do., 8 M.	..	1864	..	12·00	750	..
a.g.b.	**Meindooyeh** (was Semendrieh) . . .(iron)	335	101 9	24 7	3	3	10	5 11	1	290	2 7-in. (Armstrong), 1 l. . . .	..	1864	..	8·00	20	..
c.b.	**Mesoodieh** . . .(iron) (Sister to the English ship Superb)	9120	331 5	59 0	10	12	10	25 11	1	7431	12 10-in. 18-ton M.L.R. (Armstrong), 3 7-in. 6-ton do., 2 M., 6 l.	..	1874	..	13·00	600	..
,,	**Muin-i-Zaffer** . .(iron)	2400	230 0	36 0	5	6	10	16 5	2	2200	4 9-in. 12-ton M.L.R. (Armstrong), 1 12-c.m. K., 1 l., 6 M.	..	1869	..	12·00	220	..
c.b.	**Mukadim-i-Hair** .(iron)	2806	236 3	39 4	6	9	10	18 1	1	3000	4 9-in. 12-ton M.L.R. (Armstrong), 2 7-in. 6-ton do., 2 l., 6 M.	..	1872	..	12·00	300	..
c.b.	**Nedjim-i-Schefket** .(iron)	2080	203 5	42 7	4½	6	9	16 5	2	1900	5 8-in. 7-ton M.L.R. (Armstrong), 2 l., 5 M.	..	1868	..	11·00	300	..
b.r.	**Orkanieh** . . .(iron)	6400	292 0	55 9	5	5½	9	25 7	1	3735	1 9-in. 12-ton M.L.R. (Armstrong), 17 8-in. 6-ton do., 8 M.	..	1865	..	12·00	750	..
,,	**Osmanieh** . . .(iron)	6400	292 0	55 9	5	5½	9	25 7	1	3735	1 9-in. 12-ton M.L.R. (Armstrong), 17 8-in. 6-ton do., 8 M.	..	1864	..	12·00	750	..

One ironclad of 8600 tons displacement is now on the stocks building.

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TURKEY.—Unarmoured Ships.

fr.cr., frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; *to.g.b.*, torpedo gunboat.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Nominal Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
g.v.	**Beyruth** . . .	609	173 6	26 7	..	12 10	1	160	1 6-in. 3-ton B.L.R., 1 4¾-in. do., 6 40-pdr.	..	1863	..	10·00	120	..
sl.	**Brussa**	800	172 6	30 6	wood	15 2	1	150	2 6-in. B.L.R., 8 4¾-in. do.	..	1859	..	11·00	120	..
„	**Edirneh** . . .	782	172 6	30 6	wood	14 2	1	150	2 6-in. 5-ton B.L.R., 10 4¾-in. do.	..	1859	..	11·00	120	..
cr.	**Fezibahri**	1815	226 0	35 0	steel	14 0	2	2500	4 guns . . .	..	..	..	..	..	..
sl.	**Heibetnuma** . . .	1960	226 0	37 0	composite	14 0	1	2500	2 6-in. 5-ton B.L.R., 4 4¾-in. do.	..	1890	..	14·00	..	..
gv.	**Iskenderieh** . . .	609	173 6	26 7	wood	12 10	1	160	1 6-in. 3-ton B.L.R., 1 4¾-in. do., and 6 40-pdr.	..	1863	..	11·00	120	..
„	**Lufihumaum** . . .	1160	210 0	35 0	composite	14 0	1	1800	2 6-in. 5-ton B.L.R., 4 4¾-in. do.	..	Bldg.	..	14·00	..	..
sl.	**Mansureh**	800	174 10	30 6	wood	15 2	1	150	2 6-in. B.L.R., 8 4¾-in. do.	..	1863	..	11·00	120	..
„	**Mehemet Selim** . . .	1300	196 10	32 10	wood	16 6	1	450	21 6-in. 3-ton B.L.R.	..	1875	..	11·00	250	..
g.v.	**Mehrieh** . . .	609	173 6	26 7	wood	12 10	1	160	2 4¾-in. B L.R.	..	1863	..	10·00	120	..
fr.cr.	**Mookbir-i-Sooroor** (T. Sch.)	1477	209 11	38 0	..	17 5	1	450	22 guns . . .	..	1879	..	..	..	..
sl.	**Muzafer**	800	174 10	30 6	wood	15 2	1	150	2 6-in. 5-ton B.L.R., 10 4¾-in. do.	..	1863	..	12·00	150	..
„	**Sedul Bahr** . . .	609	173 6	26 7	wood	12 10	1	160	2 4¾-in. B.L.R. . .	..	1859	..	10·00	120	..
fr.cr.	**Selimieh**	4717	279 10	59 0	wood	23 7	1	600	25 6-in. 3-ton B.L.R., 24 4¾-in. do.	..	1865	..	10·00	350	..
to.g.b.	**Shahin-deria** . . .	450	200 0	23 0	steel	9 0	2	3500	1 10½-c.m. Krupp, 6 4·7-in. Q.F.	4 l. car.	1890	..	21·0	..	..
to.g.b.	**Namet**	900	230 0	31 0	steel	16 6	..	4500	2 10½-c.m. B.L.R. (Krupp), 6 8½-c.m. do.	4 f. tu. or l.car	1890	..	19·00	..	..
„	Not named (2 vessels) . .	260	200 0	20 3	steel	8 0	2	2700	1 4-in. B.L.R., 6 M.	..	1890	..	21·00	..	..
g.v.	**Uthared**	609	173 6	26 7	wood	12 10	1	160	2 4¾-in. B.L.R. . .	..	1863	..	10·00	120	..
„	**Zuhaf**	609	173 6	26 7	wood	12 10	1	160	2 4¾-in. B.L.R. . .	..	1862	..	10·00	120	..

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27 *Despatch Vessels and Yachts.*—Ainaly-Kawak (Paddle), Arcadia, Candia, Chania, Esser-i-Djidid, Esser-i-Neiseret, Faiz-i-Bahri, Fevaid, Iksan (Paddle), Ismail, Izzedin, Moodar-i-Zaffer, Monassir Noodooscheh-i-Reisan, Peih-i-Tidjaret, Rethimo, Rhodos (Paddle), Sahir, Seyar, Seyar-i-Derja Soolhie, Stamboul, Stankio (Paddle), Sultanieh, Surreya, Syrat (Paddle), Thalia of 194 tons to 1512 tons displacement, and 50 HP. to 800 HP. About one-half of these vessels are built of wood.

4 *Gunboats.*—Akha, Frat, Shefket-Numa, and Shat, of 200 tons displacement and 60 HP., and about 10 knots speed.

Torpedo-boats.—In addition to the torpedo-gunboats given in the alphabetical list of unarmoured vessels, there are 20 first-class torpedo-boats built and building, 10 of 88 tons and of 20 to 22 knots speed, and the remaining eleven of about 43 tons displacement and 20 knots speed.

There are also, in addition to the vessels named in the lists, screw and paddle transports and store ships, harbour ships and vessels, tugs, &c., &c.

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UNITED STATES.—Armoured Ships.

t., turret ship; *c.l.b., t.*, coast-line battle ship, turret; *a. c.*, armoured cruizer; *c.s., t.*, coast-service turret ship; *to. ram*, torpedo ram; f. tu., or l. car., fixed tube, or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Armour.		Backing.	Mean Draught of Water.	Propeller.	Indicated Horse power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
					Belt.	Turret or Battery.					Guns.	Fish Torpedo Dis-, chargers					
		tons.	ft. in.	ft. in.	inches.	inches.	inches.	ft. in.						£	knots.	tons.	knots.
c.s., t.	**Ajax** (1 turret) (iron).	2100	226 4	43 7	5	11	..	13 9	1	340	2 15-in. 19-ton smooth-bores .	..	1864	125,000	6·00	160	..
to. ram	**Alarm** (iron) . .	720	172 6	29 3	4 (on traverse)	..	16	11 2	1	800	1 15-in. smooth-bore . .	..	1873	..	11·00	..	..
c.s., t.	**Amphitrite** (2 t.) (iron) .	3815	249 4	55 9	7	11½	..	14 3	2	1600	4 10½ 25-ton B.L.R., 2 Q.F., 4 M.	..	1885 (rebuilt)	..	12·00	300	1800
„	**Camanche** (1 t.) (iron)	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	125,000	6·00	160	..
„	**Canonicus** (1 t.) (iron)	2100	226 4	43 7	5	11	..	13 9	1	320	2 15-in. 19-ton smooth-bores .	..	1864	125,000	6·00	160	..
„	**Catskill** (1 t.) (iron) .	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	..	6·00	150	..
„	Coast Defence ship .	4000	250 0	59 0	16	16–14	..	14 6	2	5400	1 16-in. 115-ton B.L.R., 1 12-in. 48-ton do., 1 15-in. dynamite gun, 15 Q.F.	..	to be built	..	..	..	..
c.s.ram	New ship . . .	2050	243 0	43 6	6	..	..	15 0	2	4800	Nil	Nil	Bldng.	..	17·00	..	..
c.l.b., t.	**Indiana** (steel) .	10,298	348 0	69 3	18	17 turret	6 to 8 in. small turrets	24 0	2	9000	4 13-in. B.L.R., 8 8-in. do., 4 6-in. do., 28 small Q.F. and M. .	..	Bldng.	604,000	16·2	400 1800*	3600
to. ram	**Intrepid** (iron) . .	1123	170 7	36 0	5	..	14	11 10	2	800	.. ..	..	1874	..	9·00	..	..
c.s., t.	**Jason** (1 t.) (iron) .	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1864	..	6·00	150	..
„	**Lehigh** (1 t.) (iron) .	1875	200 2	45 11	5	11	..	11 6	1	350	2 15-in. 19-ton smooth-bores .	..	1864	..	6·00	150	..
„	**Mahopac** (1 t.) (iron)	2100	226 4	43 7	5	10	..	13 9	1	320	2 15-in. 19-ton smooth-bores .	..	1865	..	6·00	160	..

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a. c., t.	**Maine** (2 t.) (steel)	6648	310	0	57	0	11	10½	2-in. st. dk.	21	6	2	9000	4 10-in. 26-ton B.L.R., 6 6-inch do., 8. Q.F., 17 M.	7 f. tu. orl.car.	1890	517,600	17·00	850	7000
c. s., t.	**Manhattan** (1 t.)(iron)	2100	226	4	43	7	5	10	..	13	9	1	320	2 15-in. 19-ton smooth-bores .	..	1865	..	6·00	160	..
c.l.b., t.	**Massachusetts** (steel)	10,298	348	0	69	3	18	17 turret	8 to 6 in. small turret	24	0	2	9000	4 13-in. B.L.R., 8 8-in. do., 4 6-in. do., 28 small Q.F. and M. .	..	Bldng.	604,000	16·2	400 1800*	3600
c.s, .t.	**Miantonomoh** (2 t.). (iron)	3815	249	4	55	9	7	11½	8	14	3	2	1600	4 10½-in. 25-ton B.L.R., 2 Q.F., 4 M.	..	1885 (rebuilt)	272,000	10·50	330	1800
„	**Monadnock** (2 t.) . (iron)	3815	249	4	55	9	7	11½	8	14	3	2	1600	4 10½-in. 25-ton B.L.R., 2 Q.F., 4 M.	..	1885 (rebuilt)	272,000	12·00	330	1800
„	**Montauk** (1 t.) (iron)	1875	200	2	45	11	5	11	..	11	6	1	350	2 15-in. 19-ton smooth-bores .	..	1864	..	5·50	160	..
c.s., t.	**Monterey** (steel .	4000	250	0	59	0	13	14, 10 conning tower	3 in. steel dk.	14	6	2	5400	2 15-in. B.L.R., 2 10-in. do., 6 6-pdr. Q.F., 4 other do., 4 M.	..	Bldng.	..	16·00	..	..
c.s., t.	**Nahant** (1 t.) (iron) .	1875	200	2	45	11	5	11	..	11	6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	..	6·00	160	..
„	**Nantucket** (1 t.) (iron)	1875	200	2	45	11	5	11	..	11	6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	..	5·60	160	..
cr.	**New York** (steel) (Steel Decks 6 in. and 3 in.)	8150	380	0	64	10	5 in. s. arm in way of machinery.	..	..	23	3½	2	16,500	6 8-in. B.L.R., 12 4-in. Q.F., 86-in do., 4 1-pdr. 4 M.	..	Building	..	20·00	750 1500*	13,500
c.l.b., t.	**Oregon** (steel) . .	10,298	348	0	69	3	18	17 turret	8 to 6 in. small turret	24	0	2	9000	4 13-in. B.L.R., 8 8-in. do., 4 6-in. do., 28 small Q.F. and M.	..	Bldng.	..	16·2	400 1800*	3600
„	**Passaic** (1 t.) (iron) .	1875	200	2	45	11	5	11	..	11	6	1	350	2 15-in. 19-ton smooth-bores .	..	1863	..	6·00	160	..
„	**Puritan** (2 t.) (iron) .	6060	280	0	60	0	12	11½	..	18	1	2	3700	4 10½-in. 25-ton B.L.R., 4 Q.F., 4 M.	..	1885 (rebuilt)	..	13·00	580	..
„	**Terror** (2 t.) (iron) .	3815	249	4	55	9	7	11½	8	14	3	2	1600	4 10½-in. 25-ton B.L.R., 2 Q.F., 4 M.	..	1885 (rebuilt)	206,800	12·00	330	1800
t.	**Texas** (2 t.) (steel) .	6300	290	0	64	0	12	12	3 in. steel dk.	22	6	2	8600	2 12-in. 46-ton B.L.R., 6 6-in. do., 8 Q.F., 4 M.	6 f. tu. or l.car	Bldg.	495,000	17·00	850	7000
c.s., t.	**Wyandotte** (1 t.)(iron)	2100	225	0	43	7	5	10	..	13	6	1	320	2 15-in. 19-ton smooth-bores	..	1864	..	6·00	160	..

* Quantity that can be stowed on board.

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UNITED STATES.—Unarmoured Ships.

corv., corvette; *cr.*, cruiser; *d.v.*, despatch-vessel; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; P., deck protected throughout *p.p.*, partial deck protected; f. tu. or l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament. Guns.	Armament. Fish Torpedo Dischargers	Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
sl.	Adams . . .	1375	183 9	36 0	wood	14 2	1	800	1 8-in. 8-ton smooth-bore, 4 9-in. 4-ton do., 1 60-pdr. M.L.R., 2 l., 3 M.	..	1874	..	9 00	140	..
g.v.	Alert	1020	173 10	31 10	iron	12 10	1	656	1 8-in. 7¾-ton smooth-bore, 2 9-in. 4-ton do., 1 60-pdr. B.L.R.	..	1874	..	9·00	140	..
sl.	Alliance . . .	1375	183 9	36 0	wood	14 2	1	774	1 8-in. 8-ton M.L.R., 4 9-in. 4-ton do., 1 60-pdr. M.L.R., 2 l., 1 M.	..	1875	..	9·00	130	..
cr.	Atlanta . . *p.p.*	3189	270 0	42 0	steel	17 0	1	3511	2 8-in. 11¾-ton B.L.R., 6 6-in. 5-ton do., 4 Q.F., 8 M.	..	1884	123,600	16·33	400	5000
,,	Baltimore . P.	4413	315 0	48 6	,,	19 6	2	10750	4 8-in. 11¾-ton B.L.R., 6 6-in. 5-ton do., 6 Q.F., 7 M.	5 f. tu. or l.car	1888	210,000	19·00	900	12000
,,	Bennington (was Gun-boat No. 3)	1700	230 0	36 0	,,	14 0	2	3400	6 6-in. B.L.R., 4 Q.F., 5 M. . . .	..	Building	98,000	16·00	400	9000
,,	Boston . . *p.p.*	3189	270 0	42 0	,,	17 0	1	3780	2 8-in. 11¾-ton B.L.R., 6 6-in. 5-ton do., 4 Q.F., 8 M.	..	1884	123,200	15·00	780	5000
fr. cr.	Brooklyn . .	3000	232 11	42 7	wood	19 4	1	1165	12 9-in. 4-ton smooth-bores, 1 8-in. do., 1 60-pdr. B.L.R., 8 M.	..	1858	..	10·00	275	..
,,	Charleston . P.	3730	300 0	46 0	steel	18 6	2	7500	2 8-in. B.L.R., 6 6-in. 5-ton do., 4 Q.F., 9 M.	4 f. tu. or l.car	1888	..	18·00	800	..
,,	Chicago . . *p.p.*	4500	315 0	48 2	,,	19 0	2	5000	4 8-in. B.L.R., 8 6-in. do., 2 5-in. do., 2 Q.F., 10 M.	..	1885	177,800	15·00	940	6000
cr.	Concord (was Gun-boat No. 4) . . .	1700	230 0	36 0	,,	14 0	2	3400	6 6-in. B.L.R., 4 Q.F., 5 M. . . .	..	Building	98,000	16·00	400	9000
d.v.	Dolphin . . .	1485	239 6	31 10	,,	14 2	1	2300	1 6-in. 5-ton B.L.R., 2 Q.F., 4 M. . .	..	1884	61,000	15·50	310	..
sl.	Enterprise . .	1375	183 9	36 0	wood	14 2	1	800	1 8-in. 8-ton smooth-bore, 4 9-in. 4-ton do., 1 60-pdr. do. M.L.R., 9 l., 1 M.	..	1874	..	10·00	140	..

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.	**Essex** . . .	1375	183	9	36	0	wood	14	2	1	800	1 8-in. 8-ton smooth-bore, 4 9-in. 4-ton do., 1 60-pdr. M.L.R., 2 l., 1 M.	..	1874	..	10·00	140	..
corv.	**Galena** . . .	1900	216	6	36	0	„	16	5	1	940	1 8-in. 8-ton B.L.R., 6 9-in. 4-ton smooth-bores, 1 60-pdr. B.L.R., 4 l., 1 M.	..	1877	..	10·00	125	..
fr. cr.	**Hartford** . . .	2900	226	4	42	7	„	18	4	1	1024	12 9-in. 4-ton smooth-bores, 1 8-in. 8-ton do., 4 M., 2 l.	..	1858	..	9·00	241	..
corv.	**Iroquois** . . .	1575	200	2	32	10	„	15	1	1	813	1 11-in. 7¾-ton smooth-bore, 5 8-in. 4-ton do., 1 60-pdr. M.L.R., 1 l., 1 M.	..	1858	..	8·00	128	..
„	**Juniata** . . .	1900	203	5	39	4	„	16	5	1	1304	1 8-in. 8-ton smooth-bore, 6 9-in. 4-ton do., 1 60-pdr., 4 l., and 1 M.	..	1862	..	9·00	235	..
„	**Kearsarge** . . .	1550	196	10	32	10	„	15	9	1	822	2 8-in. 8-ton smooth-bores, 4 9-in. 4-ton do., 1 60-pdr. B.L.R., 1 l., 1 M.	..	1861	..	9·00	165	..
fr. cr.	**Lancaster** . . .	3250	236	3	45	11	„	19	1	1	2000	10 8-in. smooth-bores, 8 M. . .	..	1859	..	9·60	288	..
corv.	**Marion** . . .	1900	216	6	37	0	„	16	5	1	1172	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton M.L.R., 1 60-pdr. B.L.R., 3 l., 1 M.	..	1873	..	11·00	156	..
corv.	**Mohican** . . .	1900	216	6	37	0	„	16	5	1	1172	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton B.L.R. 1 60-pdr. B.L.R., 2 l., 3 M.	..	1882	..	11·00	160	..
fr. cr.	**Newark** . . P.	4083	310	0	49	0	steel	18	9	2	8500	12 6-in. 5-ton B.L.R., 4 6-pdr. Q.F., 9 M. .	6 f. tu. or l.car	Building	250,000	18·00	850	10,500
cr.	Number 12 ("Commerce Destroyer") P.	7475	412	0	58	0	Steel	24	0	3	21,000	4 6-in. B.L.R., 12 4-in Q.F., 16 6-in. do., 8 1-pdr. do., 4 M.	6 f. tu. or l.car	Building	545,000	21·00	750 2000*	9,800 26,240
fr. cr.	**Omaha** . . .	2400	249	4	39	4	„	16	5	1	1150	10 9-in. 4-ton smooth-bores, 1 8-in. 8-ton do., 1 60-pdr. M.L.R., 5 M.	..	1868	..	12·00	150	..
cr.	New Ship (No. 6) . P.	5500	340	0	53	0	Steel (2-in. deck to 4½ slopes)	21	6	2	13,500	4 8-in B.L.R., 10 5-in. do., 14 6-in. Q.F., 4 1-pdr. do., 2 M.	6 f. tu. or l.car	Building	359,200	20·00	1300	13,000
to.cr.	New Ship (No. 1) . .	750	260	0	27	0	Steel	8	4	2	6000	.. ..	..	Building	..	23·00	..	..
cr.	New Ships (Nos. 7 and 8) P.	3893	300	0	42	6	Steel and 2½-in. deck	18	0	2	10,000	1 6-in. B.L.R., 10 4-in. do., 2 6-pdr. Q.F., 2 3-pdr. do., 4 M.	6 f. tu. or l.car	Building	220,000	19·00	..	..

* Quantity that can be stowed.

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UNITED STATES.—Unarmoured Ships—*continued.*

corv., corvette; *cr.*, cruiser; *fr.cr.*, frigate-built cruiser; *g.v.*, gun-vessel; *sl.*, sloop; P., deck protected throughout; *p.p.*, partial deck protected; f. tu. or l. car., fixed tube or launching carriage for discharging Fish torpedoes.

Class.	NAME.	Displacement.	Length.	Beam.	Material of Hull.	Mean Draught of Water.	Propeller.	Indicated Horse-power.	Armament.		Date of Launch.	Cost.	Speed.	Coal Supply.	Distance that can be steamed at 10 knots.
									Guns.	Fish Torpedo Dis-chargers					
		tons.	ft. in.	ft. in.		ft. in.						£	knots.	tons.	knots.
cr.	New Ship (Nos. 9, 10, and 11)	2000	257 0	37 0	Steel	14 6	2	5400	2 6-in. B.L.R., 8 4-in. do., 2 6-pdr. Q.F., 2 3-pdr. do., 4 M.	6 f. tu. or l.car	Building	122,500	17·00	..	..
corv.	**Ossipee** . . .	2400	203 5	39 4	„	16 5	1	1304	1 11-in. 8-ton smooth-bore, 6 9-in. 4-ton do.	..	1861	..	8·00	230	..
fr. cr.	**Pensacola** . . .	3000	229 7	42 7	„	18 9	1	1165	2 9-in. 8-ton smooth-bore, 2 80-pdr. B.L.R. do., 2 60-pdr. do., and 4 M.	..	1859	..	9·00	310	..
cr.	**Petrel** (was Gun-boat No. 2)	890	175 0	31 0	steel	11 7	1	1300	4 6-in. B.L.R., 2 3-pdr. Q.F., 5 M. . .	..	1888	50,000	13·0	160	..
cr.	**Philadelphia** (was Cruiser No. 4) . P.	4413	315 0	48 6	„	19 3	2	10,500	4 8-in. B.L.R., 6 6-in. do., 6 Q.F., 7 M. .	5 f. tu. or l.car	Building	265,000	19·0	..	..
corv.	**Quinnebaug** . .	1900	216 6	36 0	wood	16 5	1	1103	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton B.L.R. 1 60-pdr. B.L.R., 3 l.	..	1875	..	9·00	160	..
g.v.	**Ranger** (Surveying) .	1020	173 10	31 10	iron	12 10	1	656	1 60-pdr. M.L. Parrott	..	1874	..	8·00	127	..
fr. cr.	**Richmond** . .	2700	226 4	42 7	wood	17 4		1078	12 9-in. 4-ton smooth-bore, 1 8-in. 8-ton do., 1 60-pdr. M.L.R,. 2 l., and 6 M.	..	1860	..	9·00	290	..
cr.	**San Francisco** (was Cruiser No. 5) . P.	4083	310 0	49 2	steel	18 9	2	10,500	12 6-in. B.L.R., 6 Q.F., 7 M. . . .	6 f.tu. or l.car	Building	270,000	19·0	..	..
corv.	**Swatara** . . .	1900	216 6	36 0	„	16 5	1	1176	6 9-in. 4-ton smooth-bores, 1 8-in. 8-ton B.L.R. 1 60-pd. B.L.R., 4 l., 1 M.	..	1873	..	9·00	186	..
cr.	**Vesuvius** (Dynamite Gun Cruiser)	725	246 0	26 6	„	9 0	2	3200	3 dynamite guns, 10½ in. cal., 2 Q.F, 5 M.	..	1888	70,000	20·00	28	..
g.v.	**Yantic** . . .	900	180 5	29 6	„	12 2	1	670	1 8-in. 8-ton smooth-bore, 2 9-in. 4-ton do., 1 60-pdr. M.L.R., 2 l. 1 M.	..	1878	..	8·00	125	..
cr.	**York Town** (was Gun-boat No. 1)	1700	230 0	36 0	steel	14 0	2	3400	6 6-in. B.L.R., 4 Q.F., 5 M. . . .	..	1888	98,000	16·0	400	9000

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Paddle steamers.—Michigan (685 tons and 300 horse-power), Monocacy (1370 tons and 850 horse-power), Powhattan (3980 tons), Tallapoosa (1270 tons and 1100 horse-power).

Steamers (fourth-rate).—Despatch (560 tons, 402 I.HP.); Palos (420 tons and 350 horse-power); Fortune, Leyden, Mayflower, Nina, Pinta, Speedwell, Standish, Triana (each 450 tons and 440 I.HP.); Catalpa (190 tons), Cohasset (450 tons).

Torpedo-boats.—Three torpedo-boats, 136 feet long, 14 feet wide, 100 tons displacement, 1600 I.HP., and 22 knots speed; two 128 feet long, and one 108 feet.

Submarine torpedo-boats.—Nautilus, built in London, and The Peacemaker, built in America.

Surveying ships, training ships, store ships, harbour ships, tugs, &c., are not included in the above lists.

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URUGUAY.

Gunboats.—General Artiga, 274 tons, 520 I.HP., 12½ knots speed, 2 12-c.m. B.L.R. (30 calibres, Krupp), 2 M.

General Rivera, 300 tons, 12 knots speed, and having an armament of 1 15-c.m. B.L.R., 1 6-c.m. ditto, and the General Jaurez (was Tastique).

Also an iron steamer of 400 tons displacement, the Malvinias, built at Elbing in 1882.

VENEZUELA.

Steamer.—Augusta, iron, launched in 1884.

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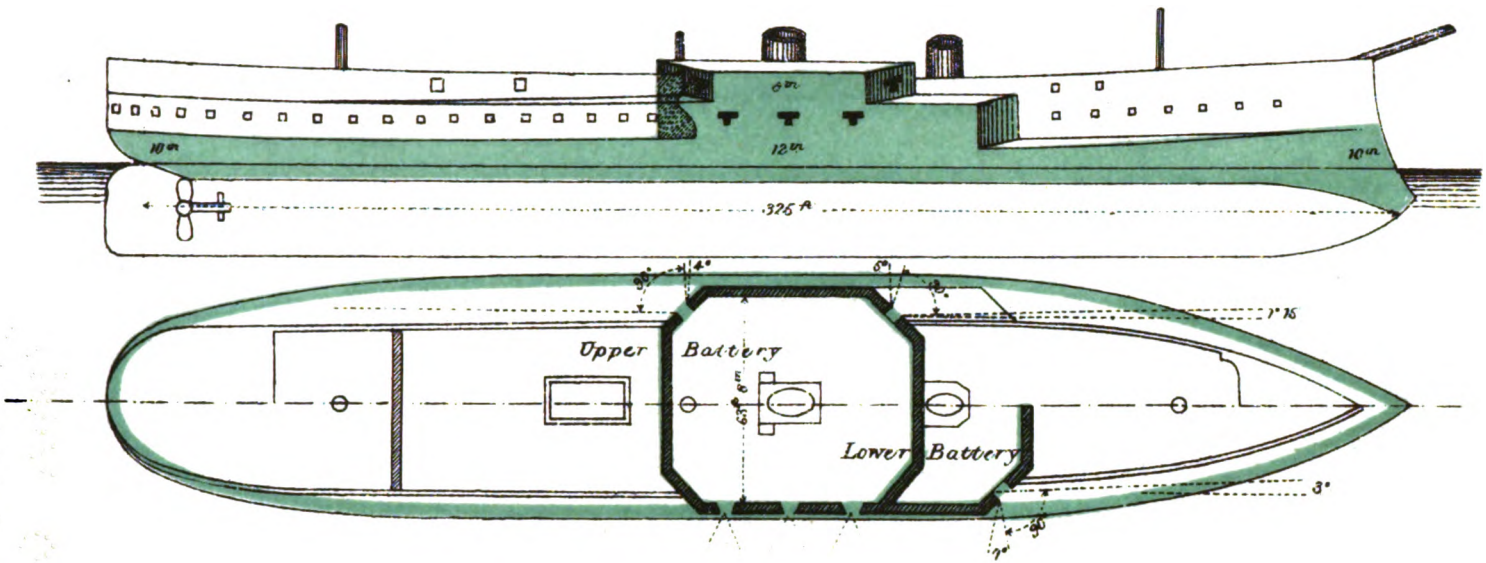
"Alexandra."



HANHART LITH.

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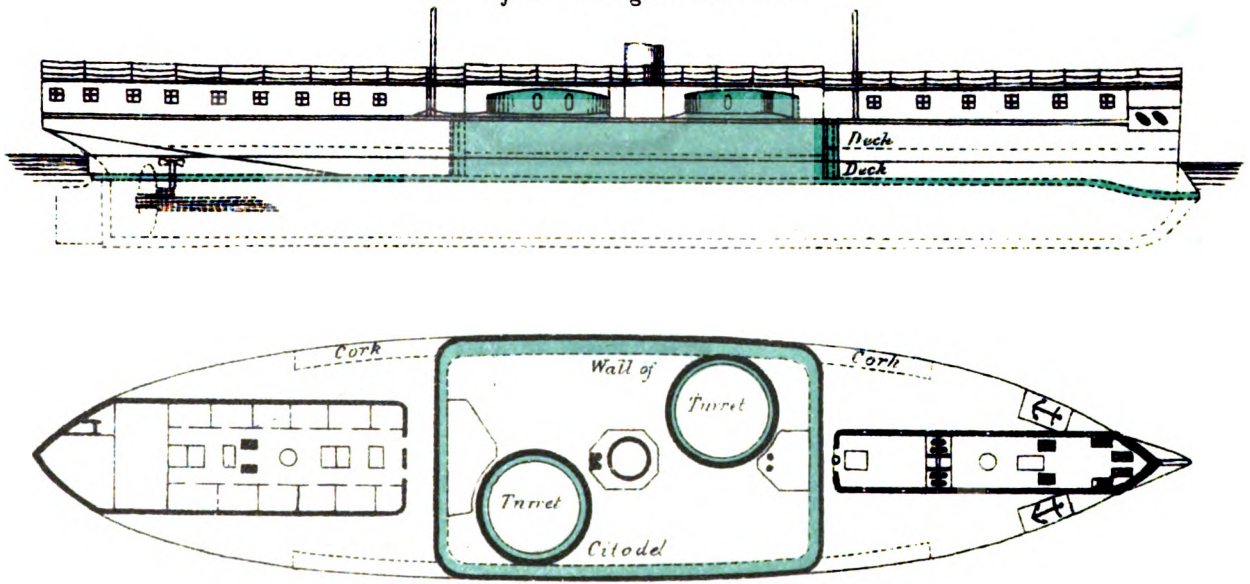
BRITISH SHIPS.

"Ajax" & "Agamemnon"



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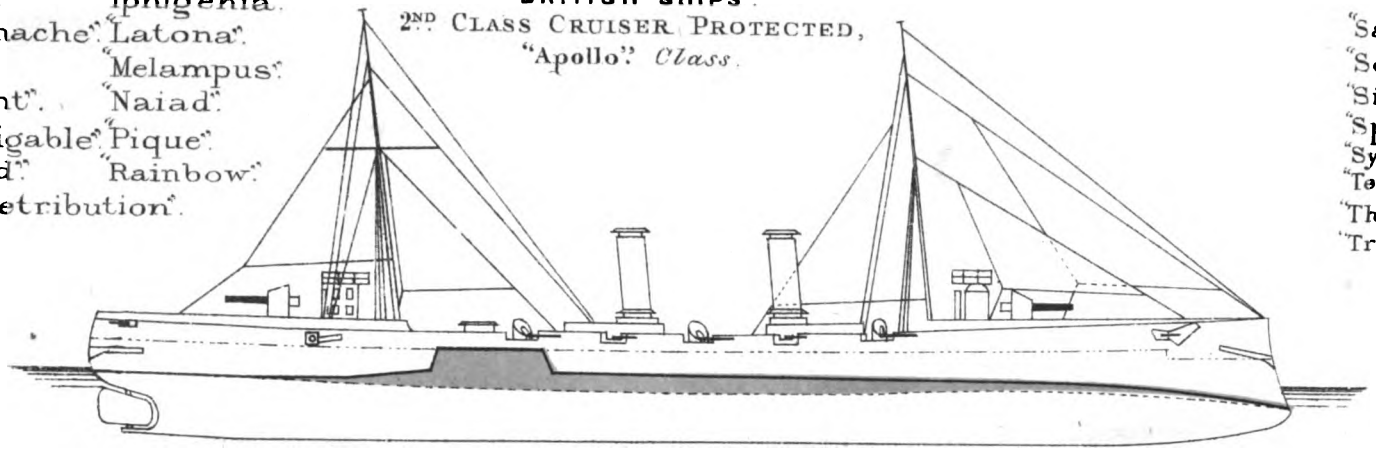
"Æolus".
"Andromache".
"Apollo".
"Brilliant".
"Indefatigable".
"Intrepid".
"Iphigenia".
"Latona".
"Melampus".
"Naiad".
"Pique".
"Rainbow".
"Retribution".

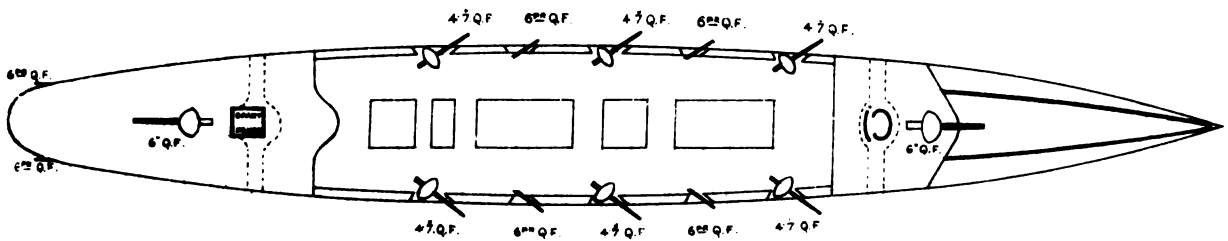
BRITISH SHIPS.

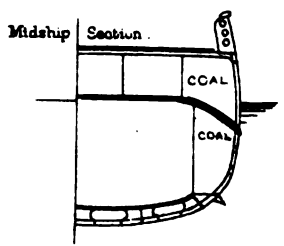
2ND CLASS CRUISER PROTECTED,

"Apollo" *Class.*

"Sappho".
"Scylla".
"Sirius".
"Spartan".
"Sybille".
"Terpsichore".
"Thetis".
"Tribune".







Special Scale

HANNART LITH.

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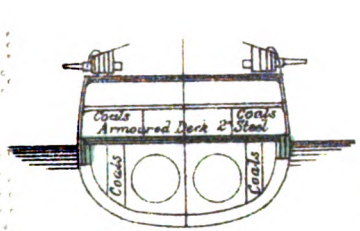
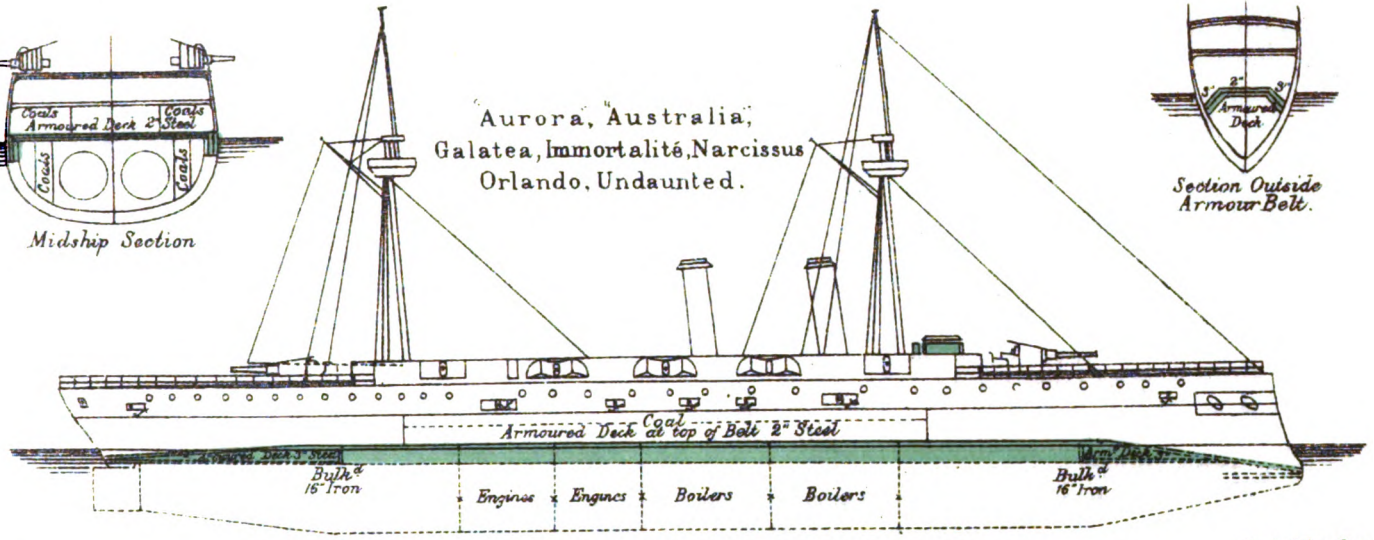


Midship Section

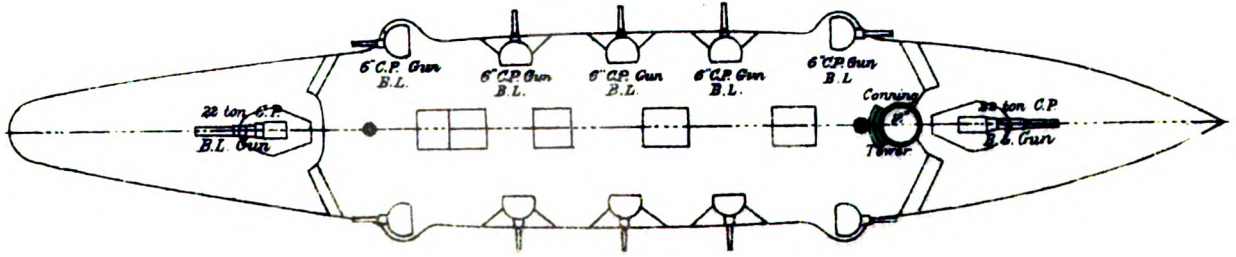
"Aurora," "Australia,"
Galatea, Immortalité, Narcissus
Orlando, Undaunted.

Section Outside Armour Belt.



Quick-firing Guns

Upper Deck.



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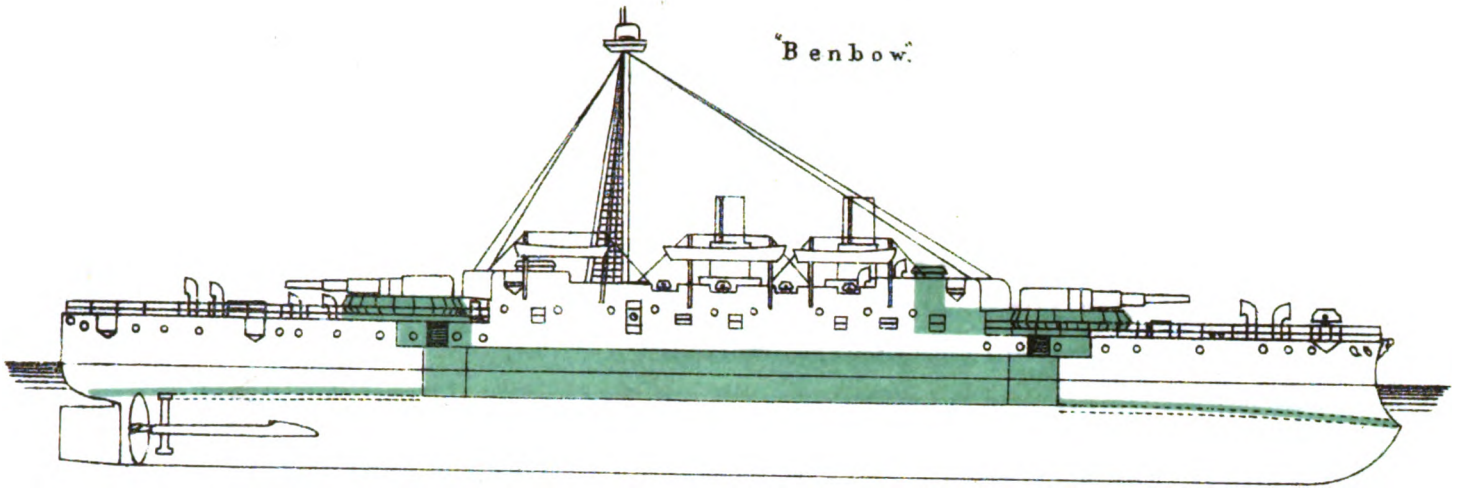
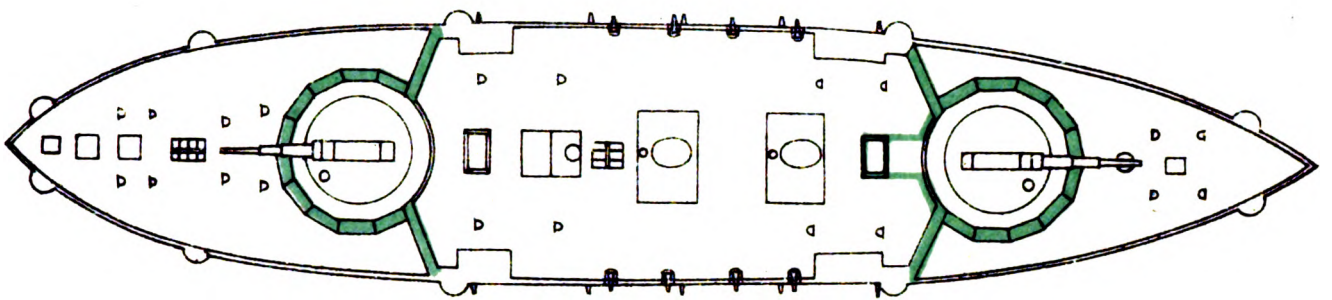
"Benbow."



Spar Deck.



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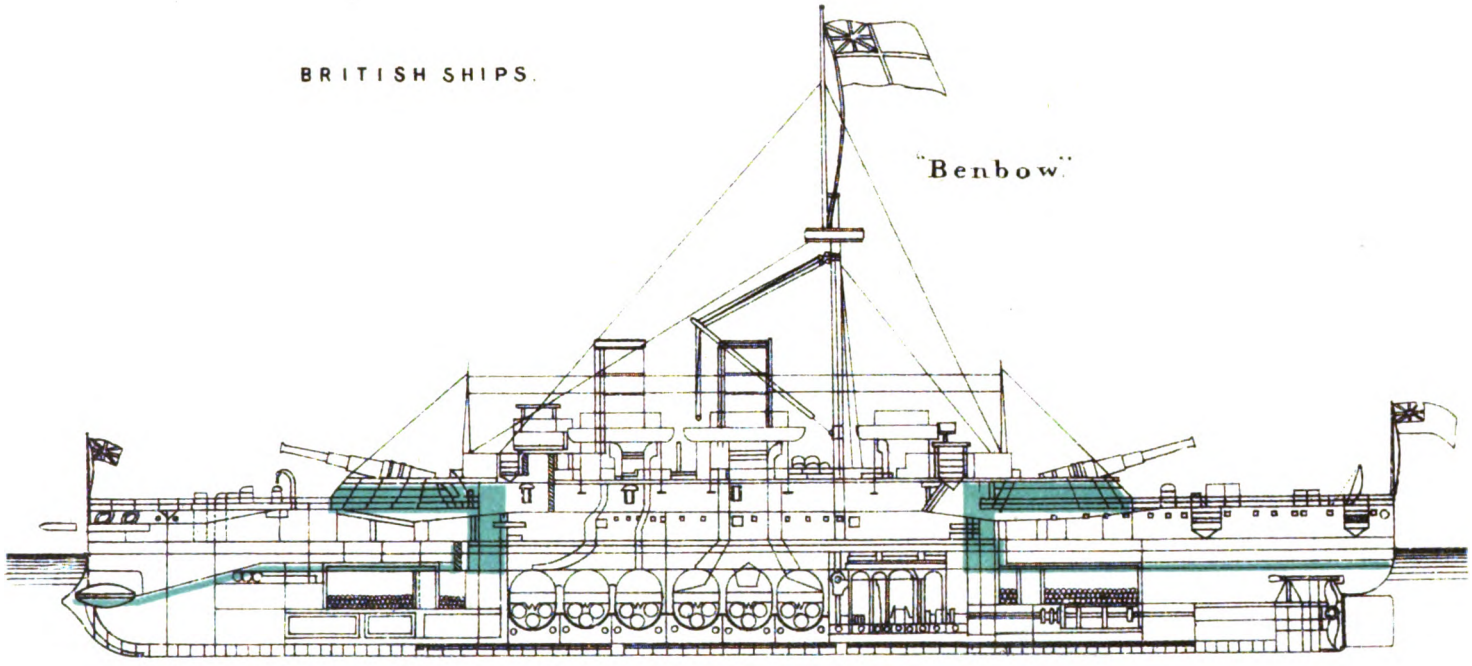
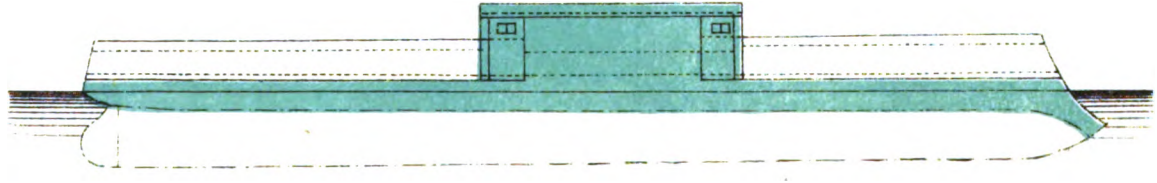
BRITISH SHIPS.

"Benbow."



"Belleisle & Orion."



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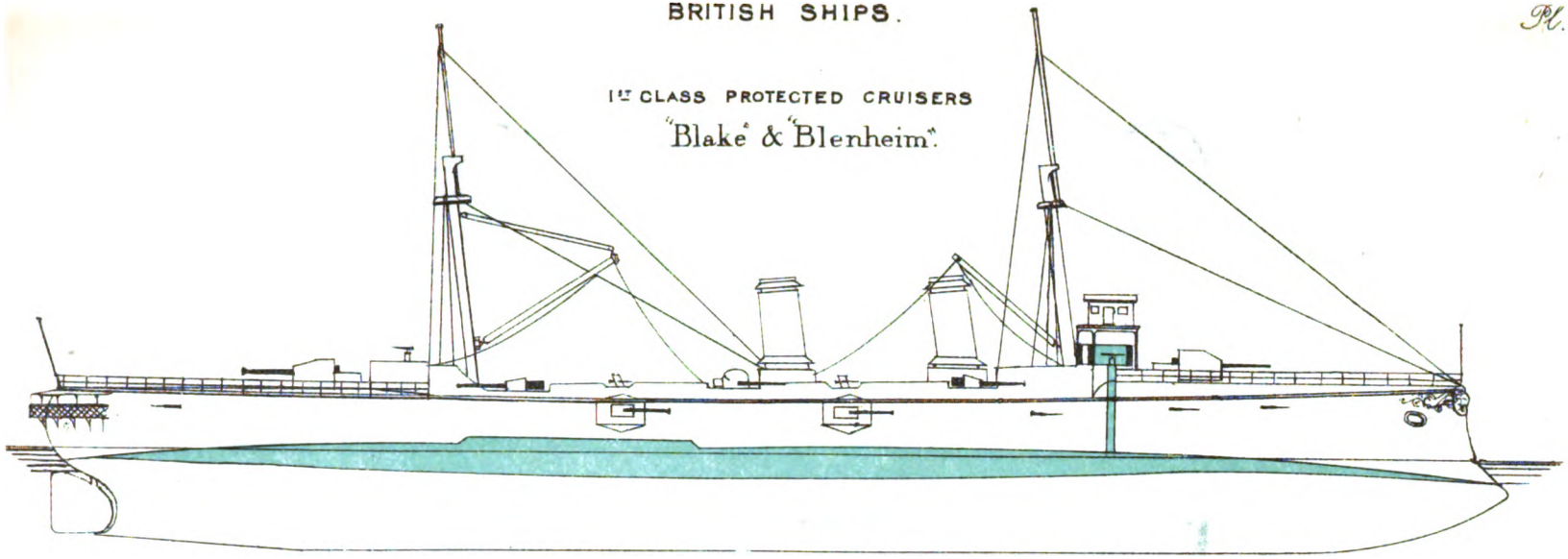
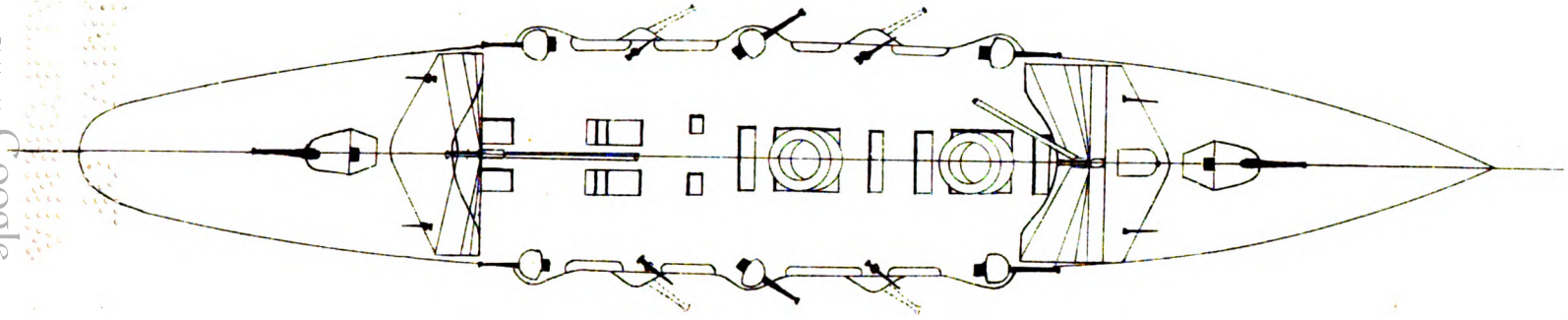
BRITISH SHIPS.

1st CLASS PROTECTED CRUISERS

"Blake" & "Blenheim".





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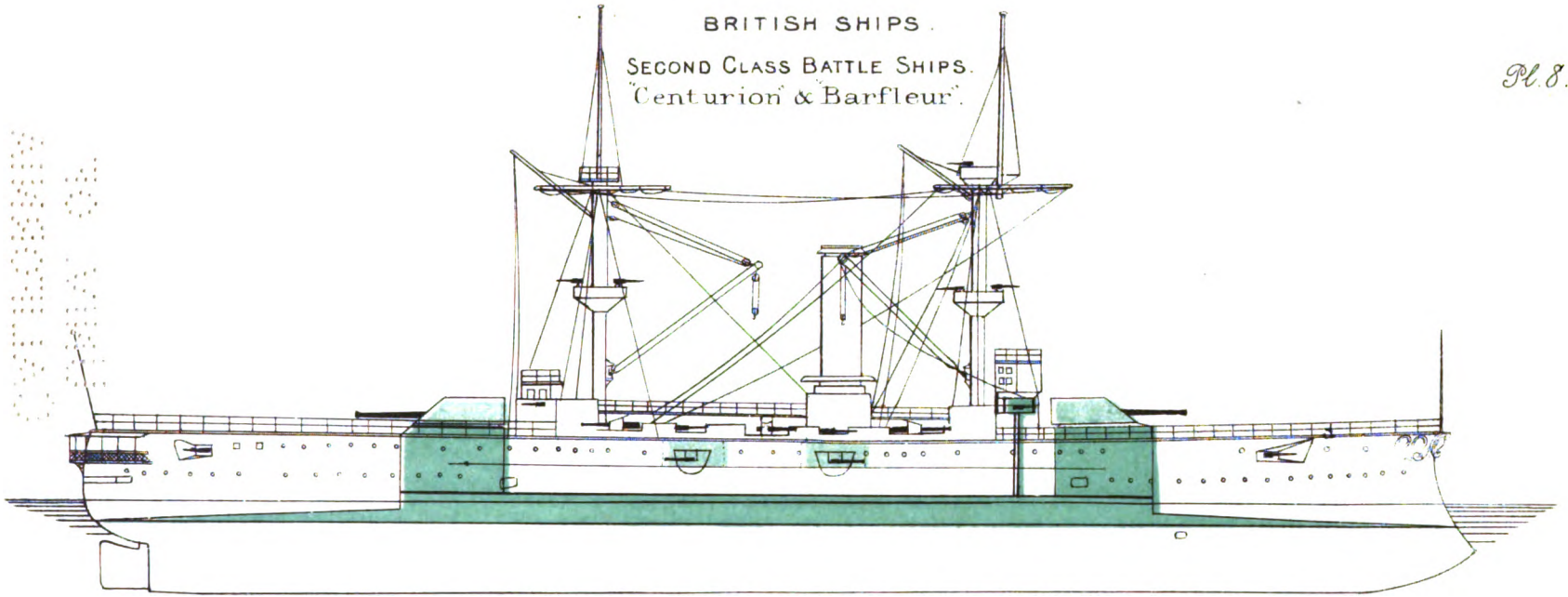
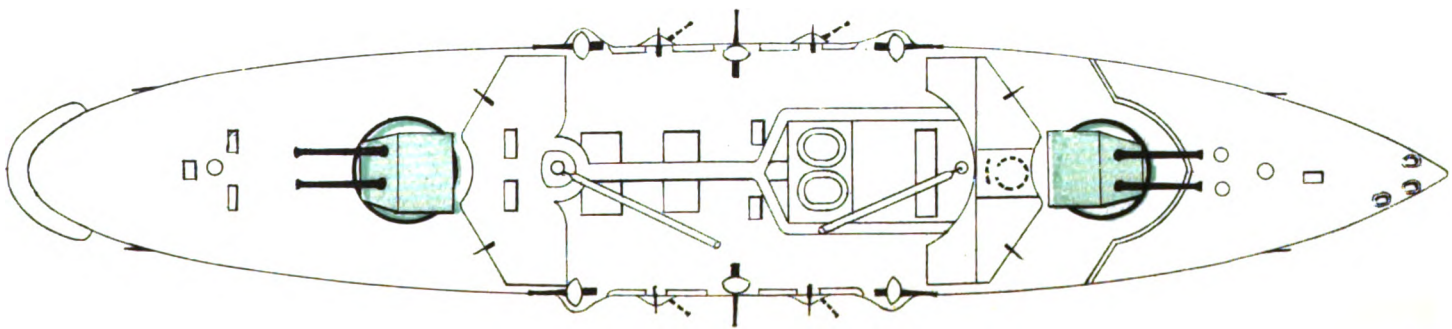
BRITISH SHIPS.

SECOND CLASS BATTLE SHIPS.

"Centurion" & "Barfleur".

Pl. 8.





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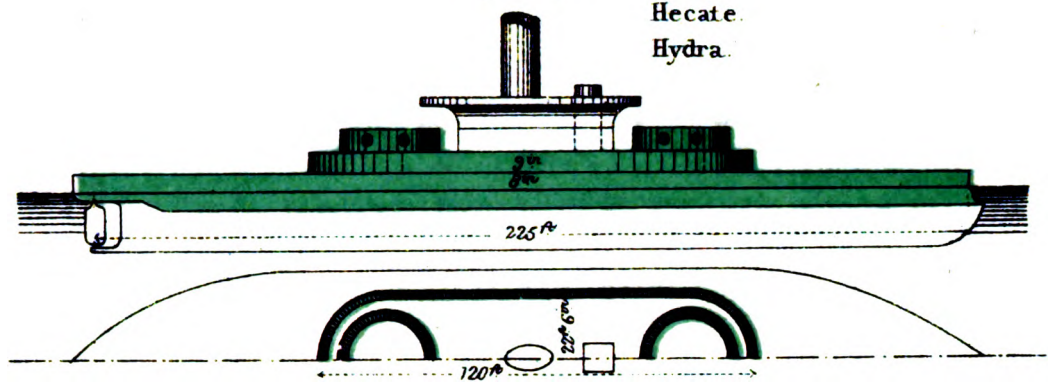
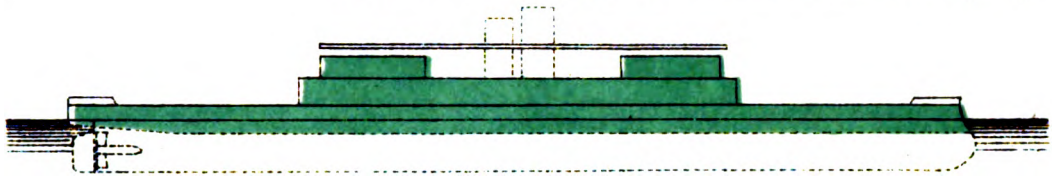
BRITISH SHIPS.

"Cyclops." Gorgon. Hecate. Hydra.



"Cerberus" & "Magdala." *(Colonial & Indian Marine respectly)*



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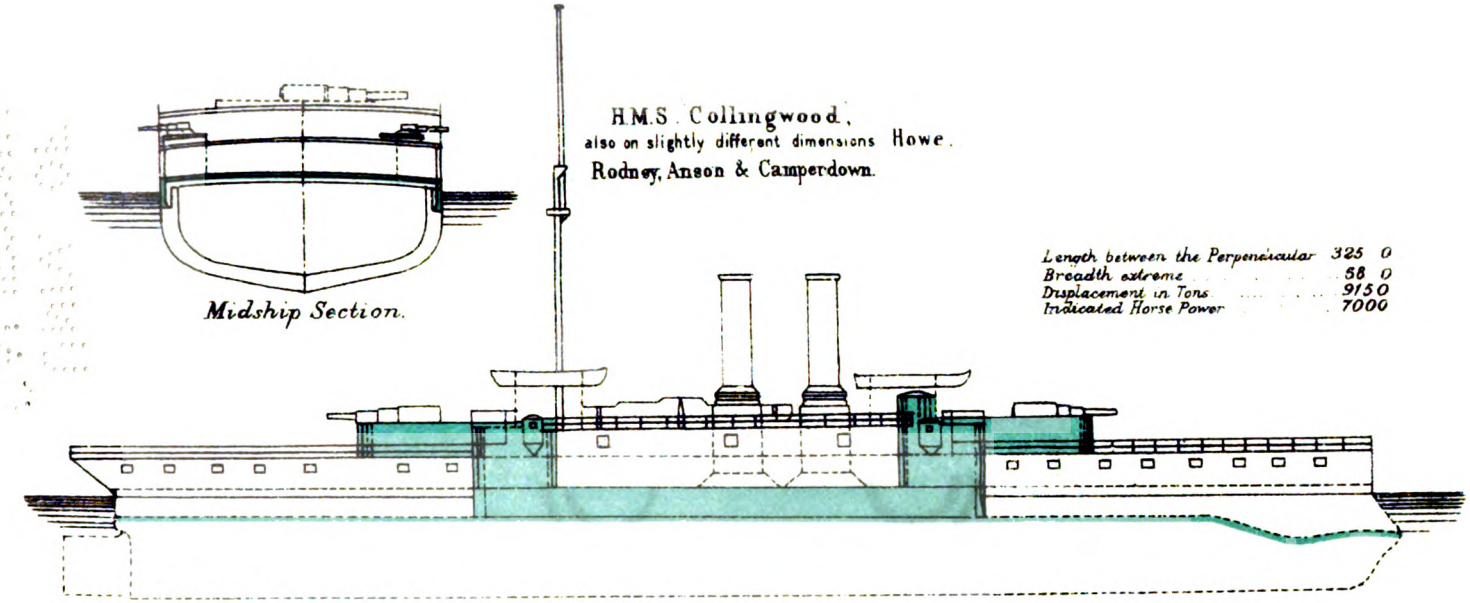
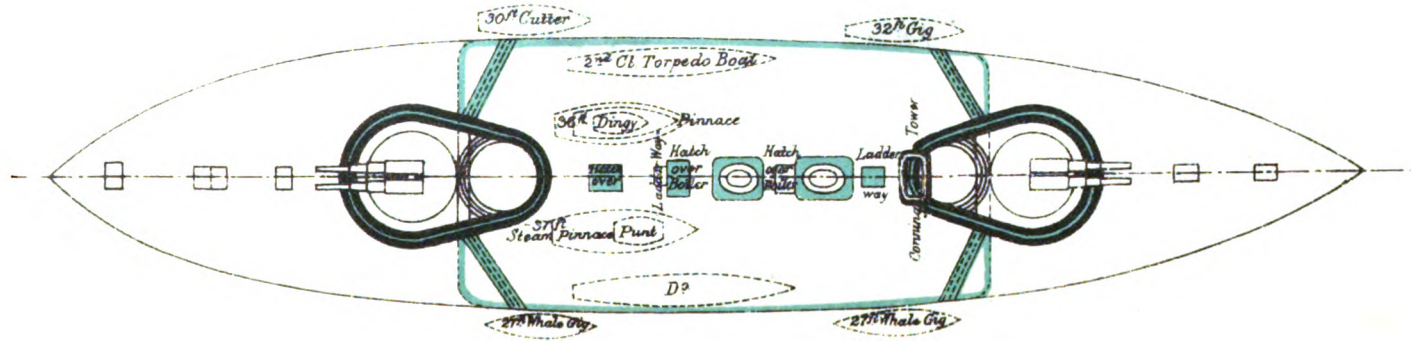
H.M.S. Collingwood,
also on slightly different dimensions Howe.
Rodney, Anson & Camperdown.

Midship Section.

Length between the Perpendicular	325 0
Breadth extreme	68 0
Displacement in Tons	9150
Indicated Horse Power	7000



Plan of Spar & Upper Decks.



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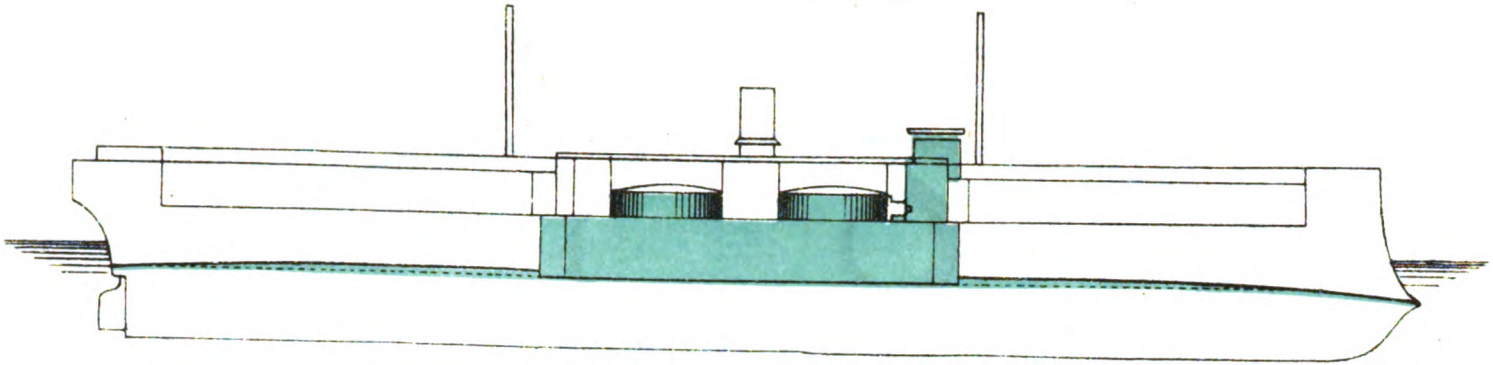
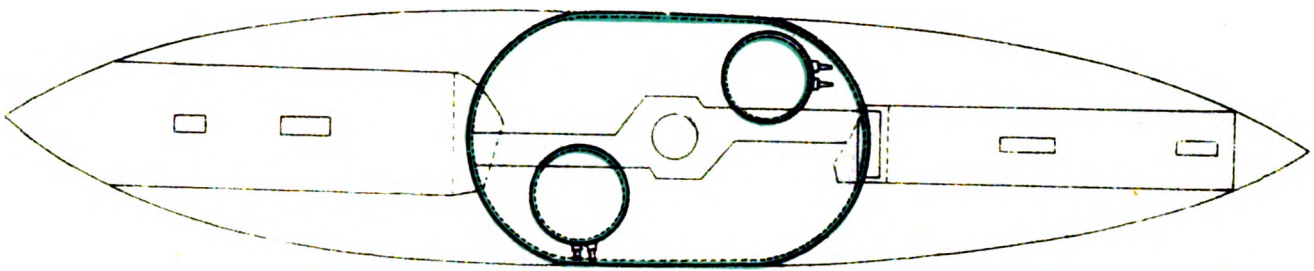
"Colossus" & "Edinburgh."





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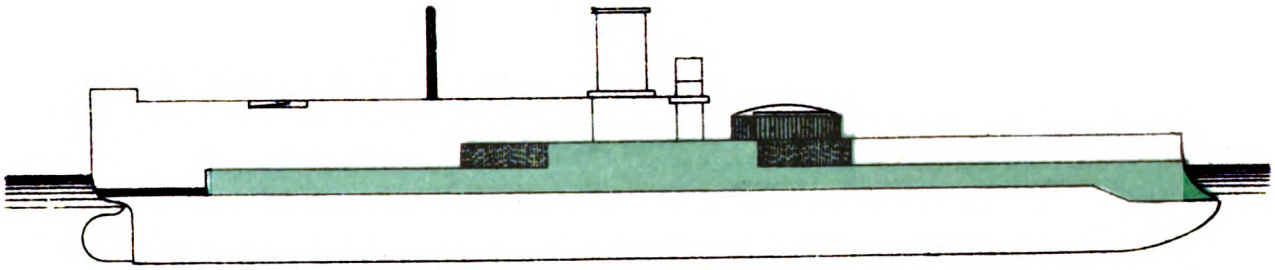
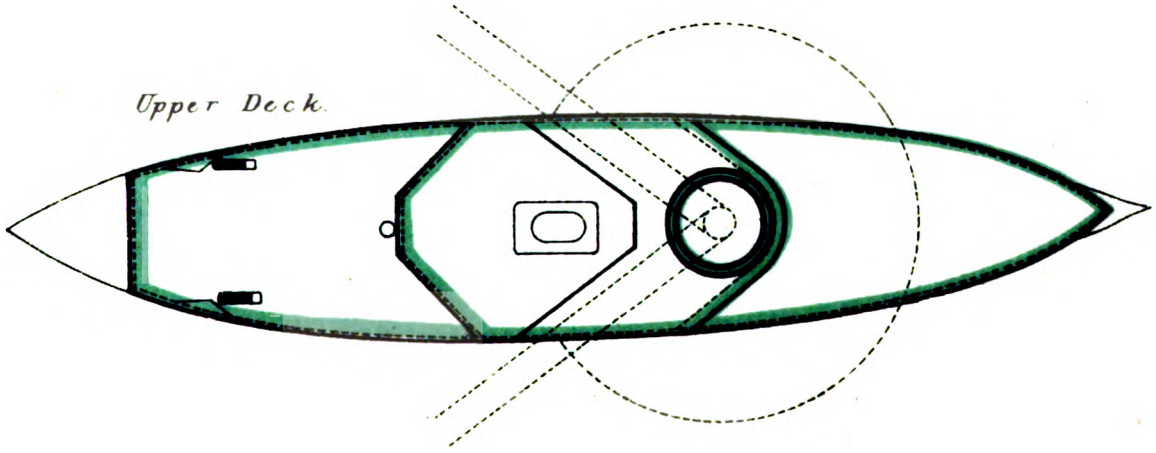
BRITISH SHIPS.

"Conqueror" & "Hero".





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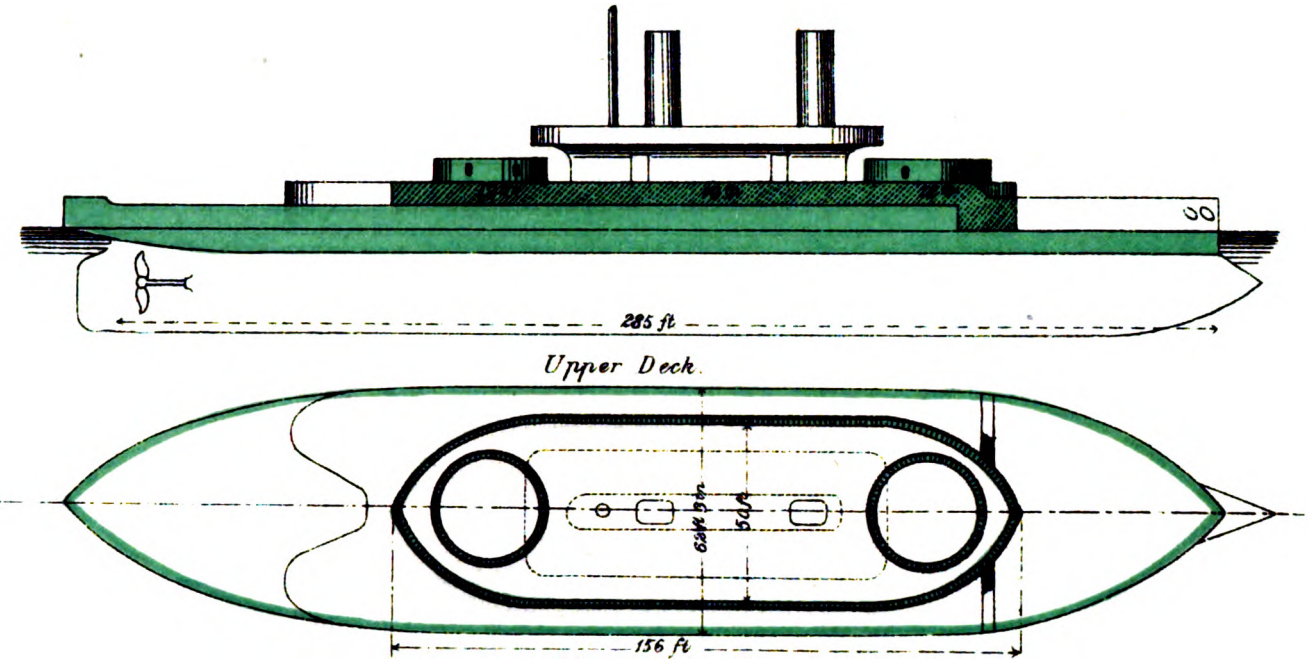
"Devastation"
"Thunderer"



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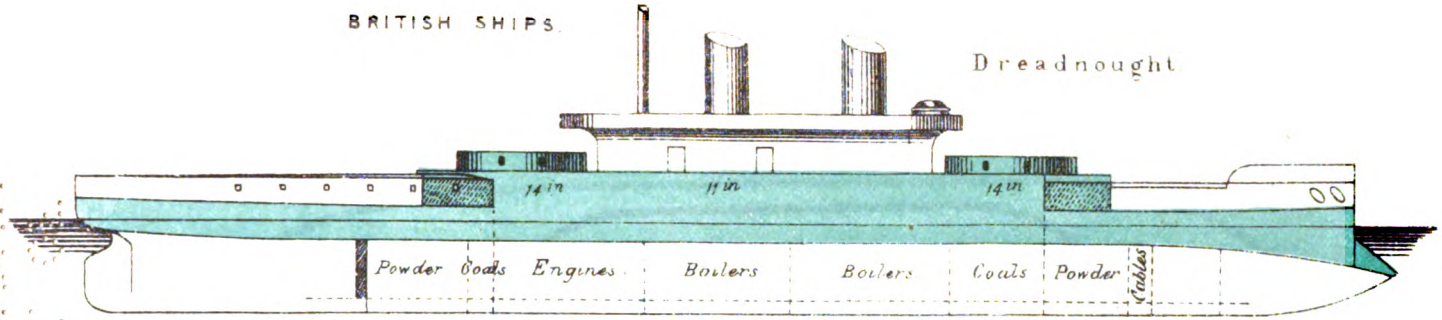
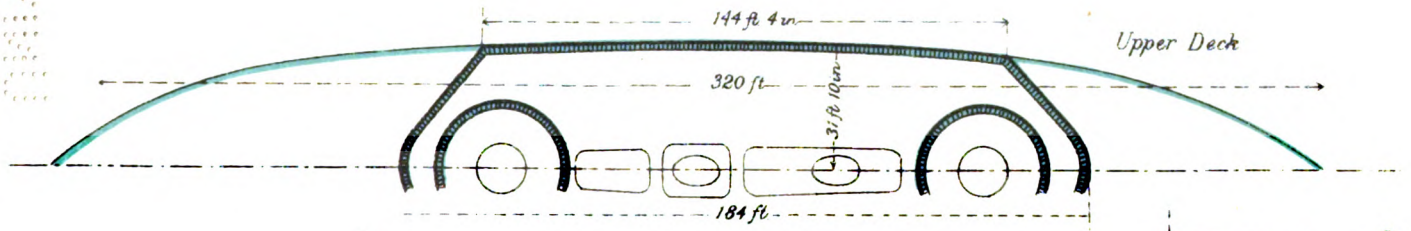
BRITISH SHIPS.

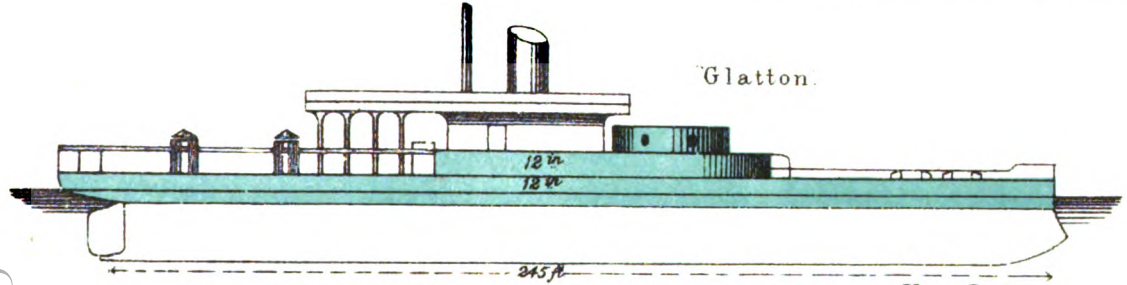
Pl. 14.

Dreadnought

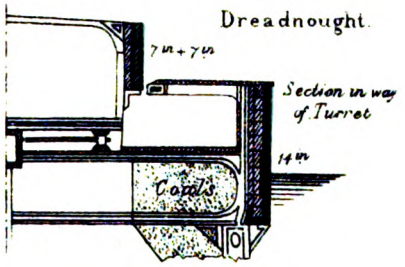




Glatton.



Dreadnought.



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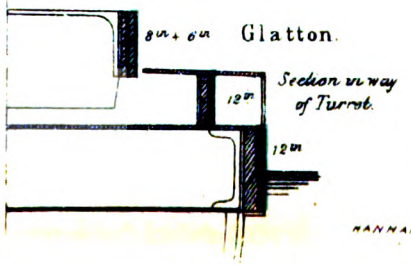

HANNART LITH.

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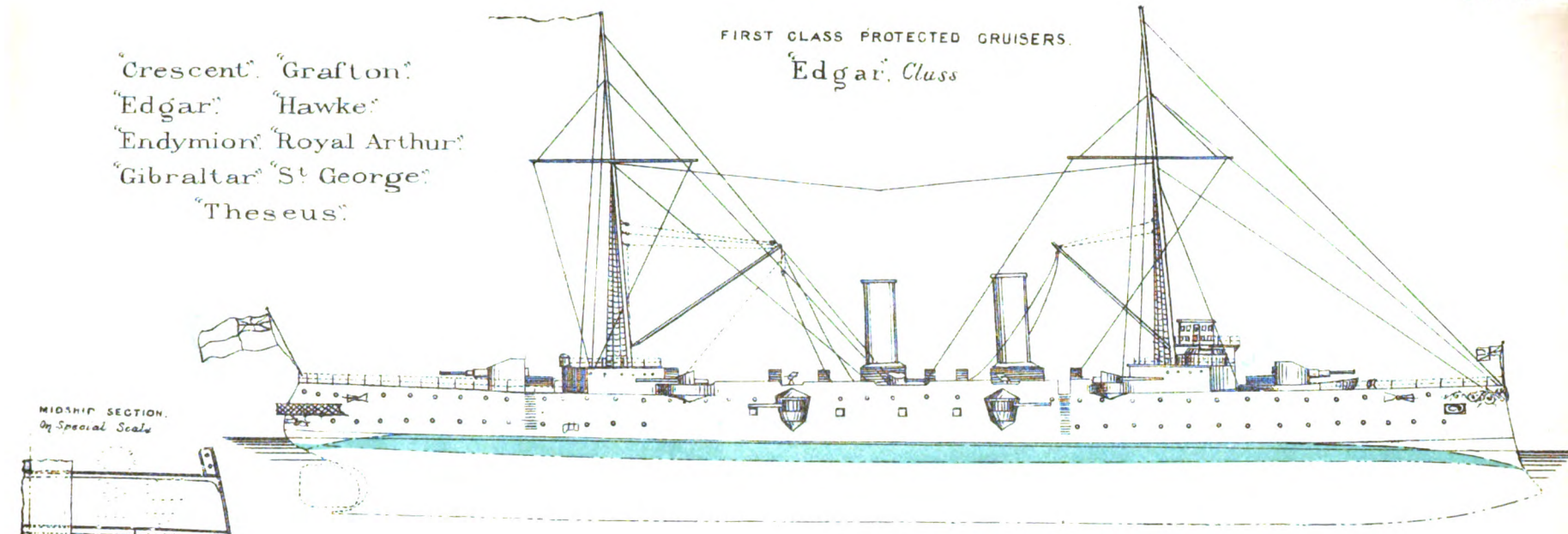
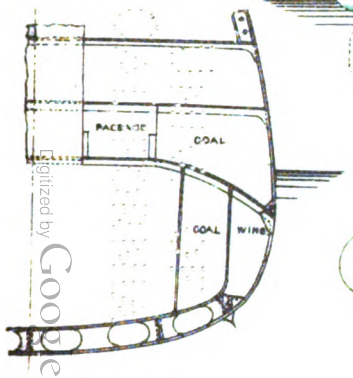
FIRST CLASS PROTECTED CRUISERS.

"Edgar" *Class*

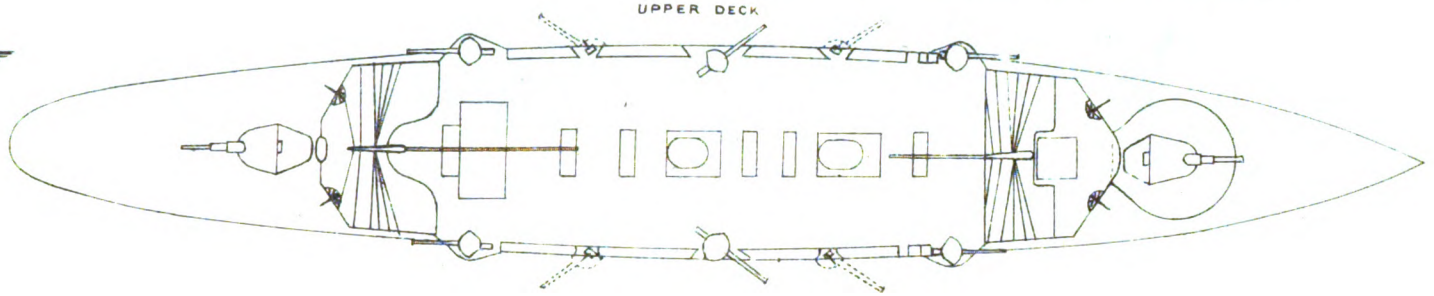
"Crescent" "Grafton"
"Edgar" "Hawke"
"Endymion" "Royal Arthur"
"Gibraltar" "St George"
"Theseus"



MIDSHIP SECTION.
On Special Scale



UPPER DECK



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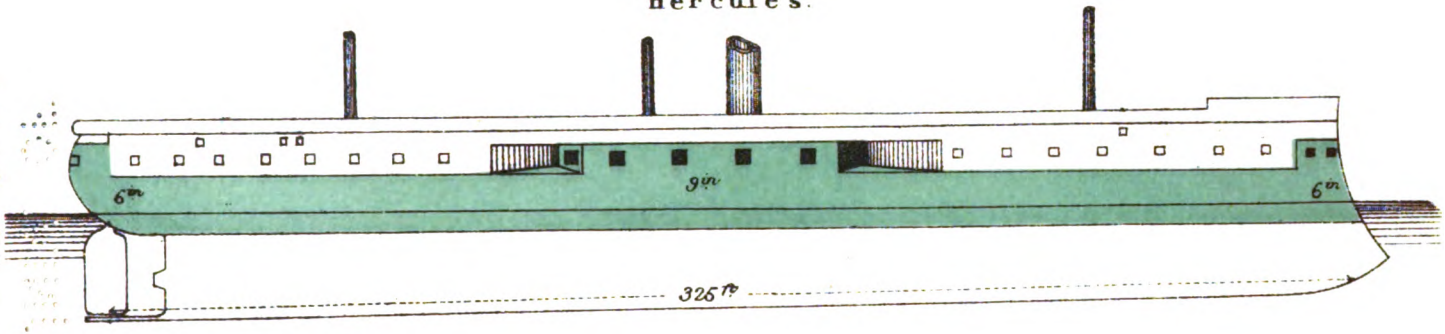
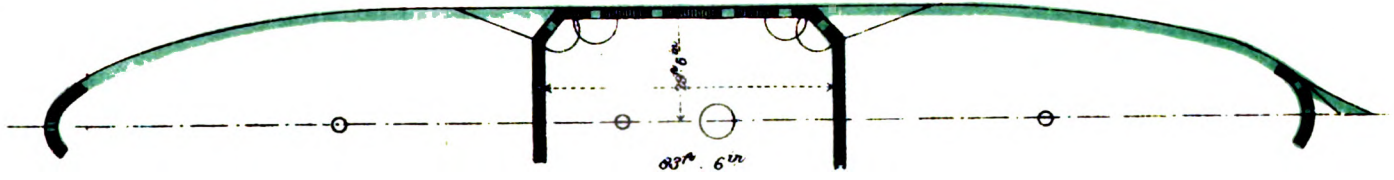
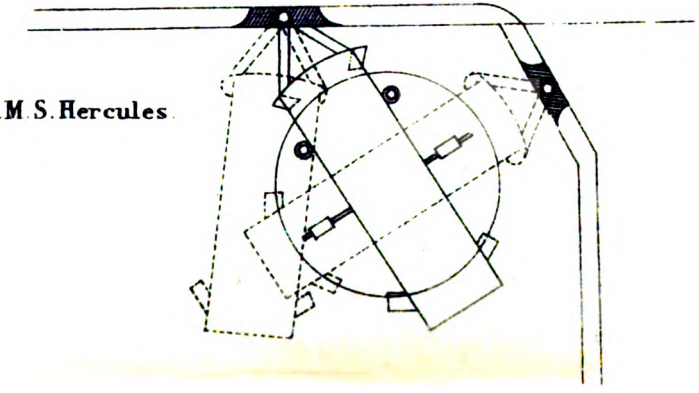
BRITISH SHIPS.

"Hercules."







Angle Port of H.M.S. Hercules.

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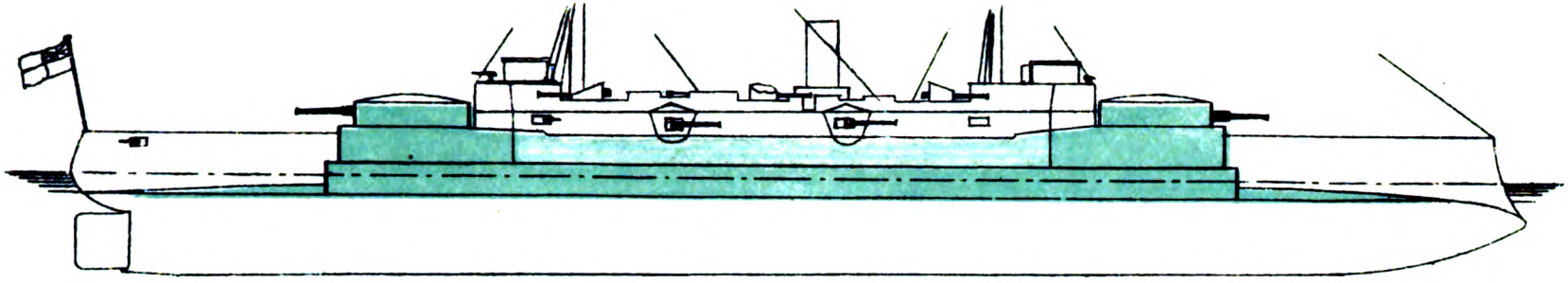
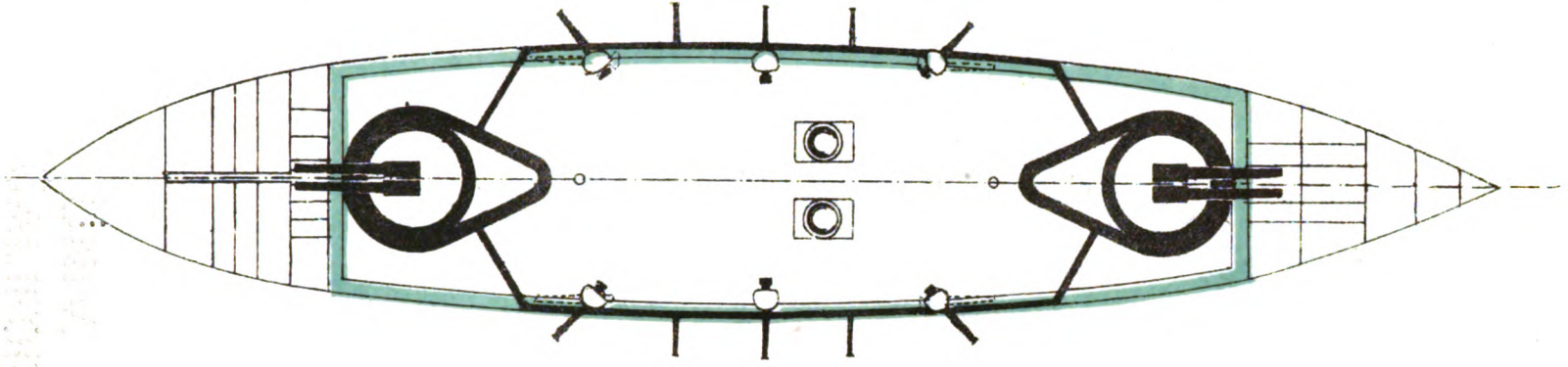
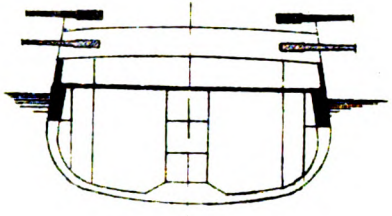
"Hood" (Turret Ship with Redoubts.)







On Special Scale.

HANHART LITH.

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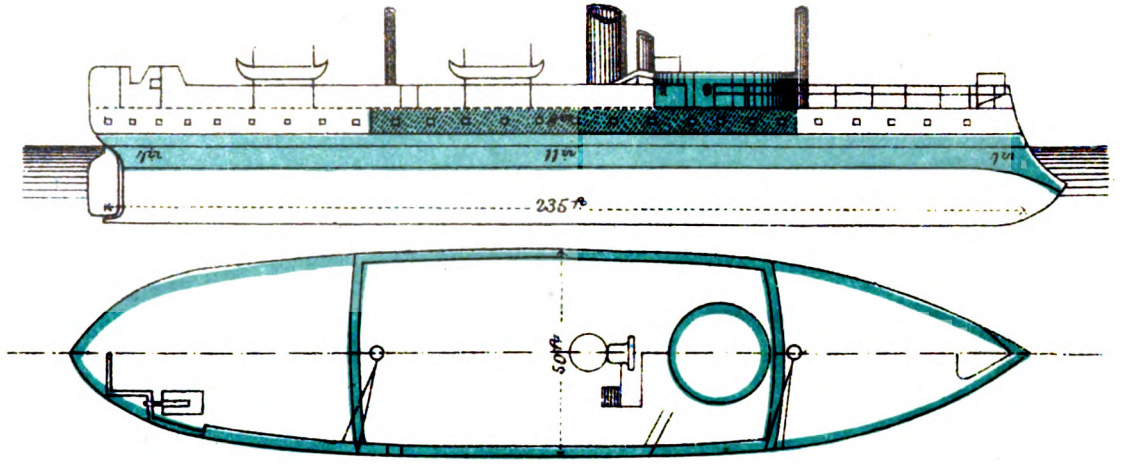
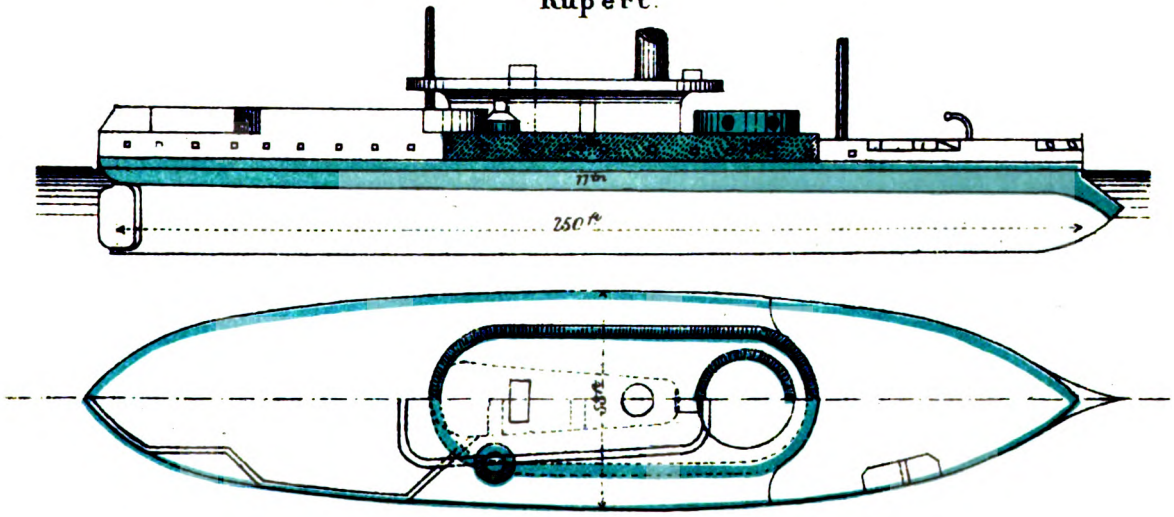
"Hotspur."



"Rupert."



Breastwork Deck

YANNART LITH.

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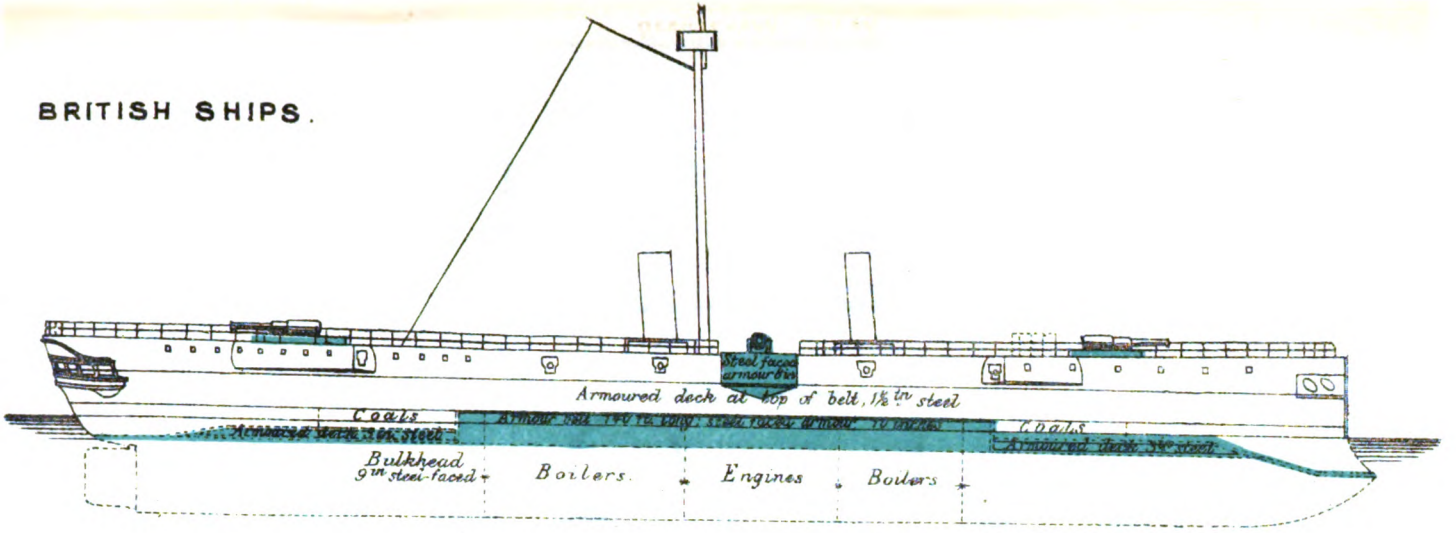
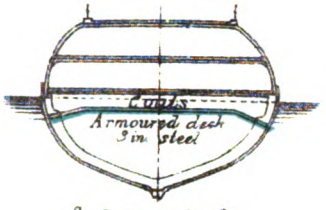
BRITISH SHIPS.



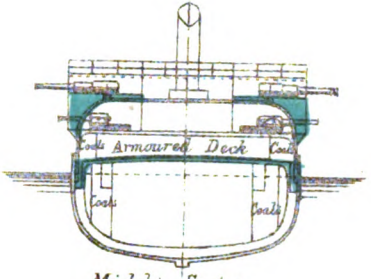
"Imperieuse"

"Warspite"

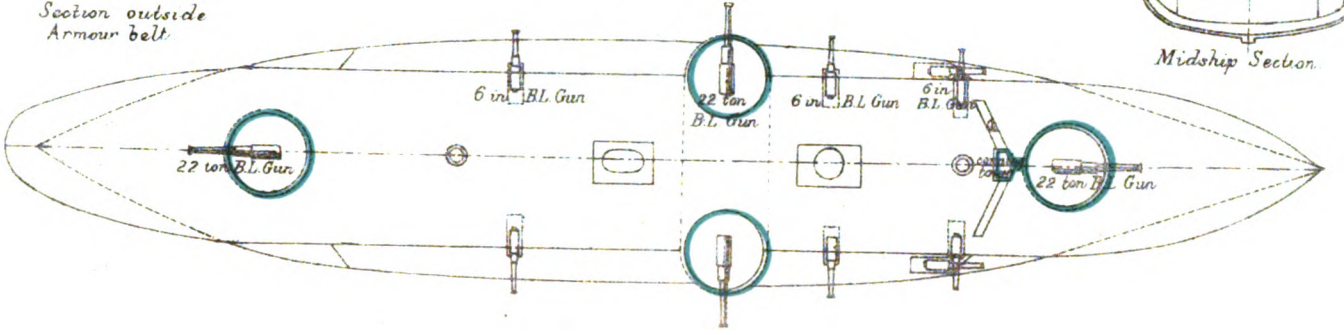
Upper Deck



Section outside Armour belt



Midship Section



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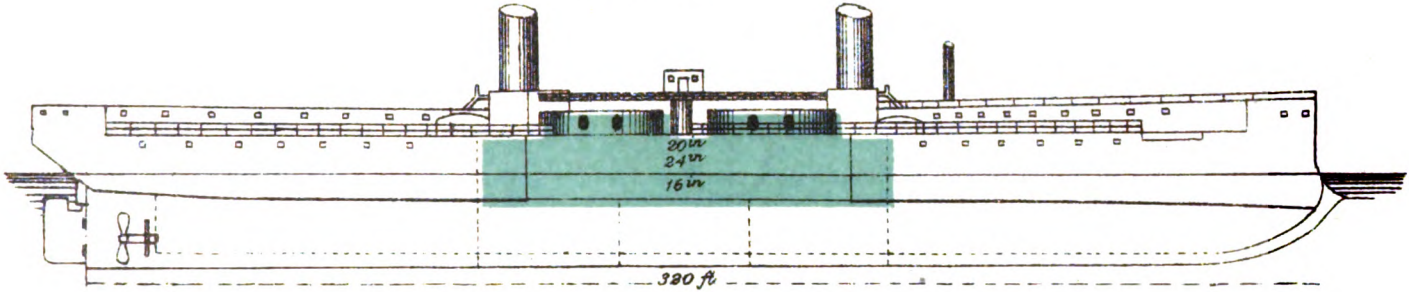
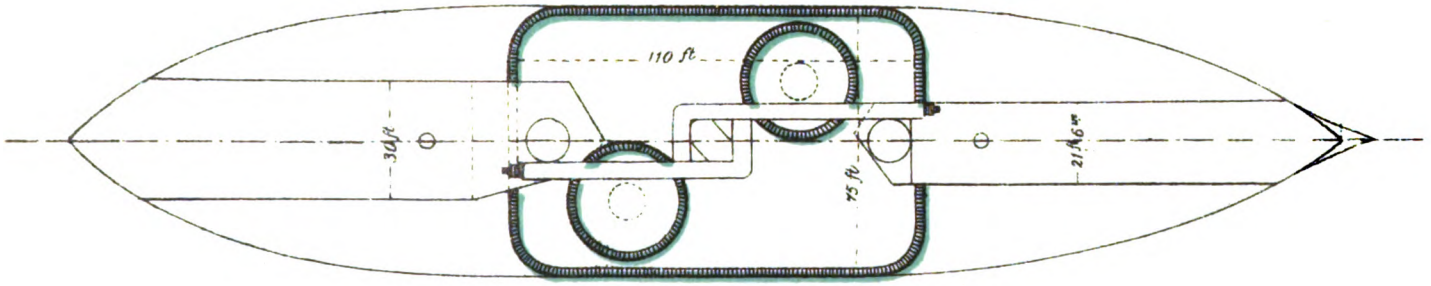
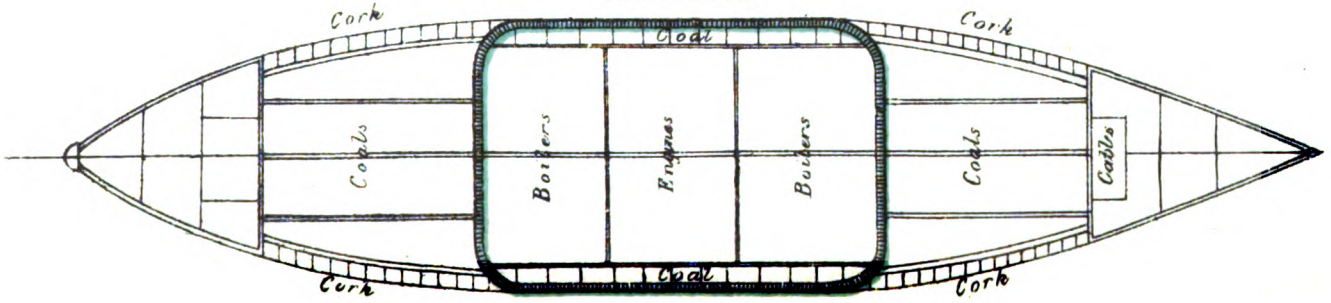
"Inflexible."



Upper Deck



Lower Deck.



HANHART LITH

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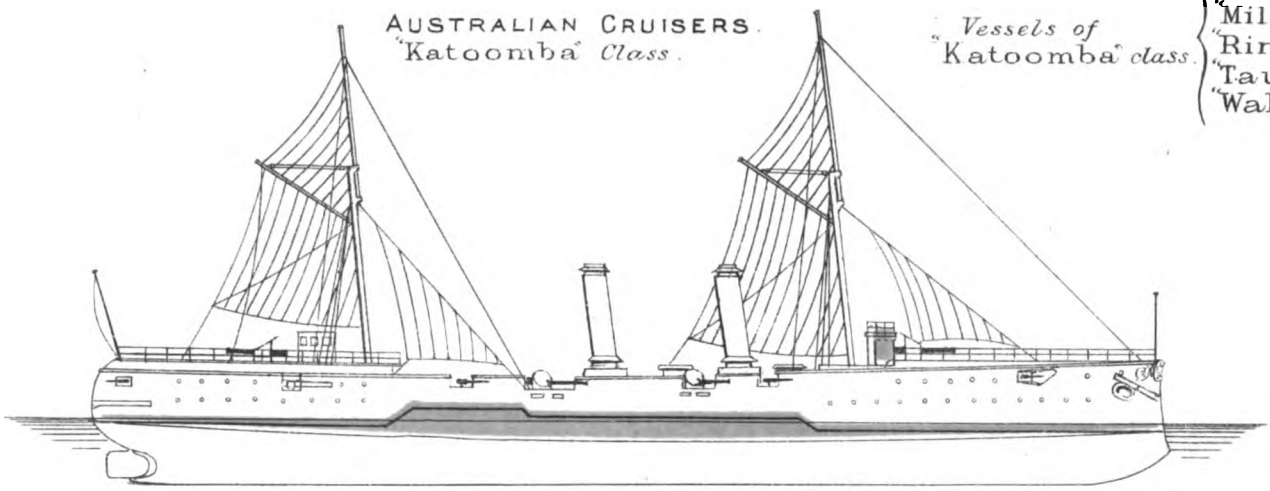
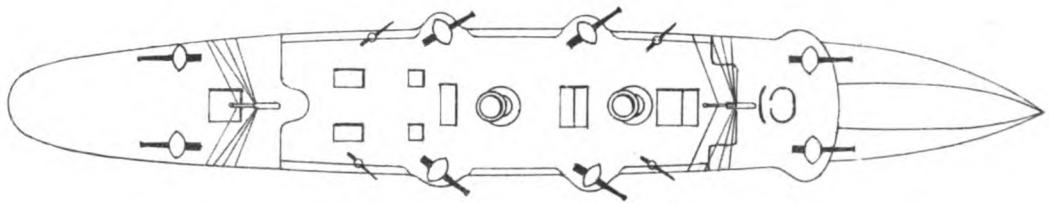
BRITISH SHIPS.

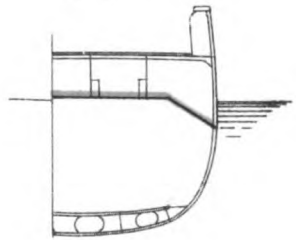
AUSTRALIAN CRUISERS.
"Katoomba" *Class.*

Vessels of "Katoomba" *class.*
- "Katoomba".
- "Mildura".
- "Ringarooma".
- "Tauranga".
- "Wallaroo".





Or Special Scale.



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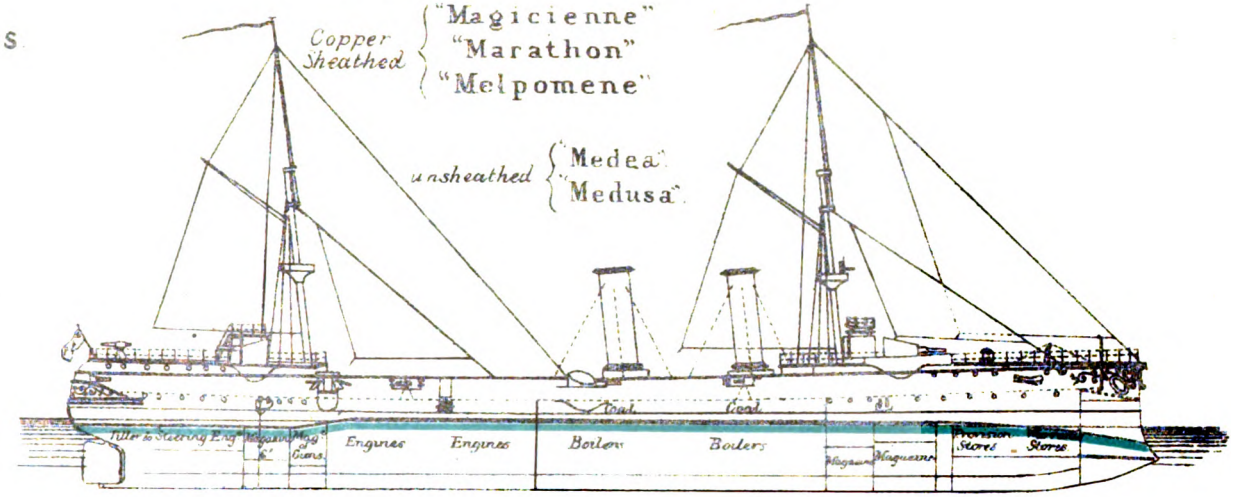
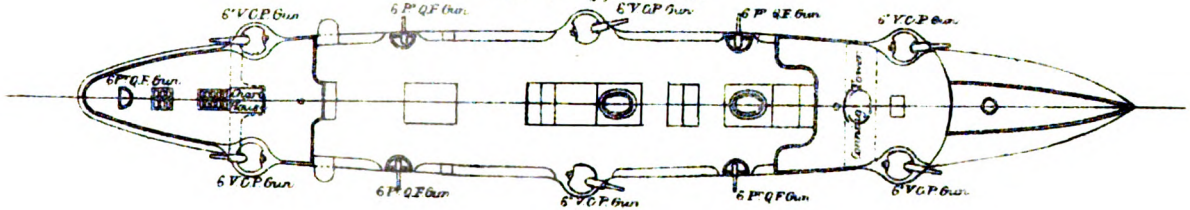
3rd Class Protected Cruisers.

Copper Sheathed { "Magicienne" "Marathon" "Melpomene"

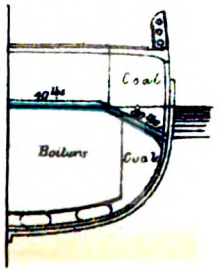
unsheathed { "Medea" "Medusa"



Plan of Upper Works.



Midship Section.



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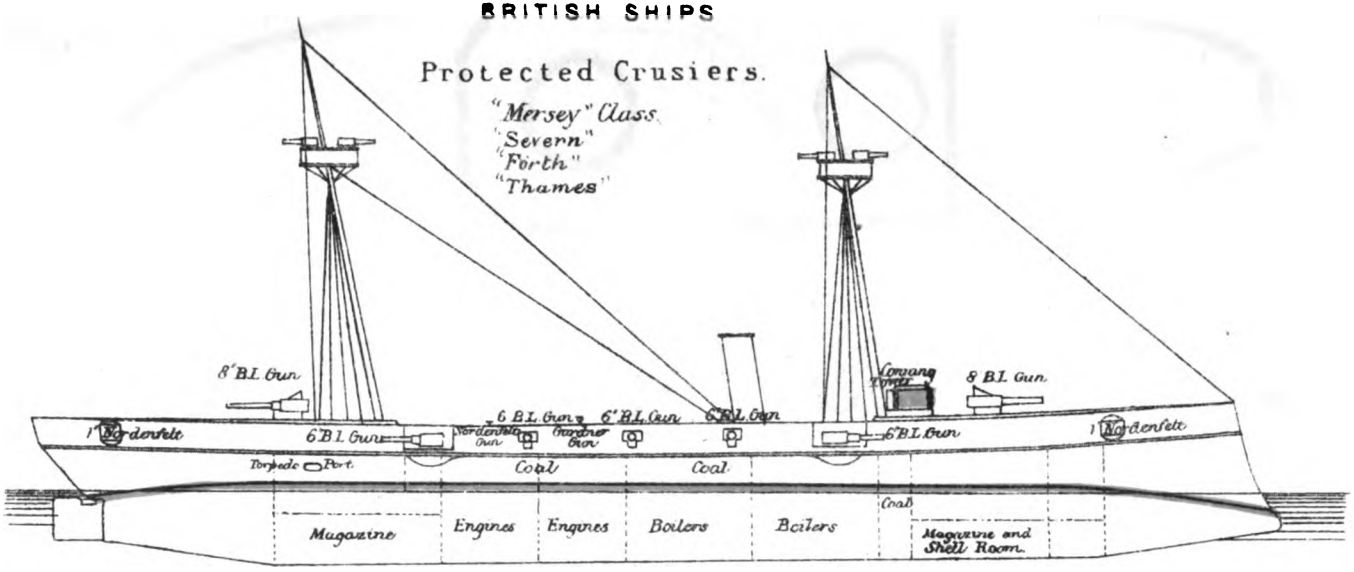
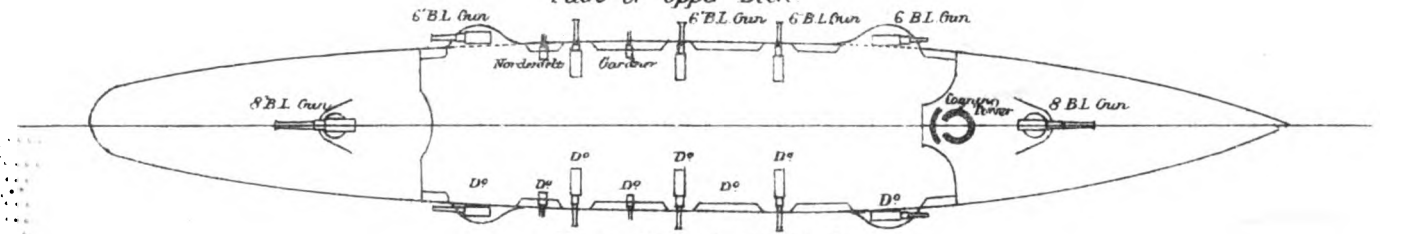
BRITISH SHIPS

Protected Crusiers.

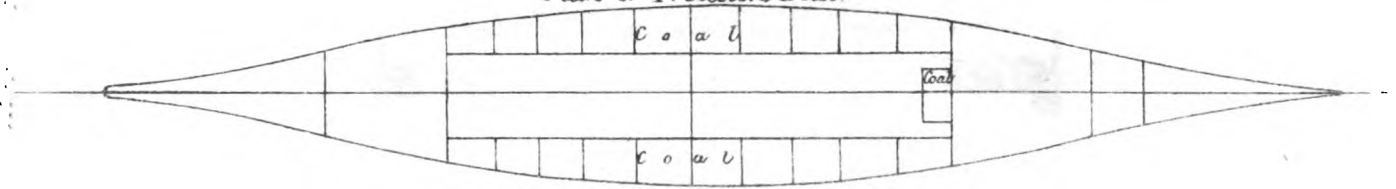
"Mersey" Class.
"Severn"
"Forth"
"Thames"



Plan of Upper Deck



Plan of Protective Deck.



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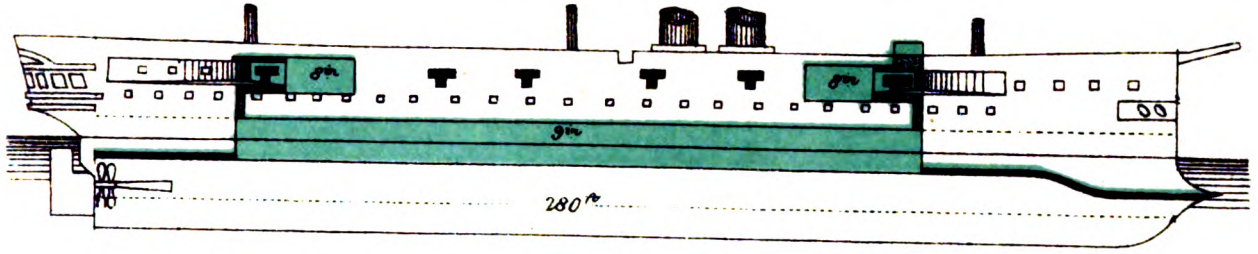
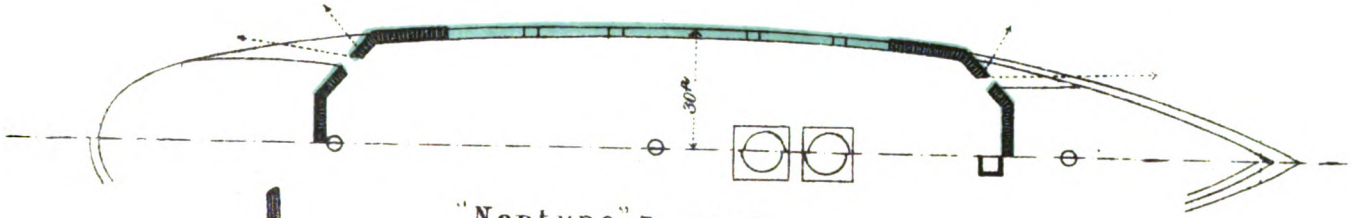
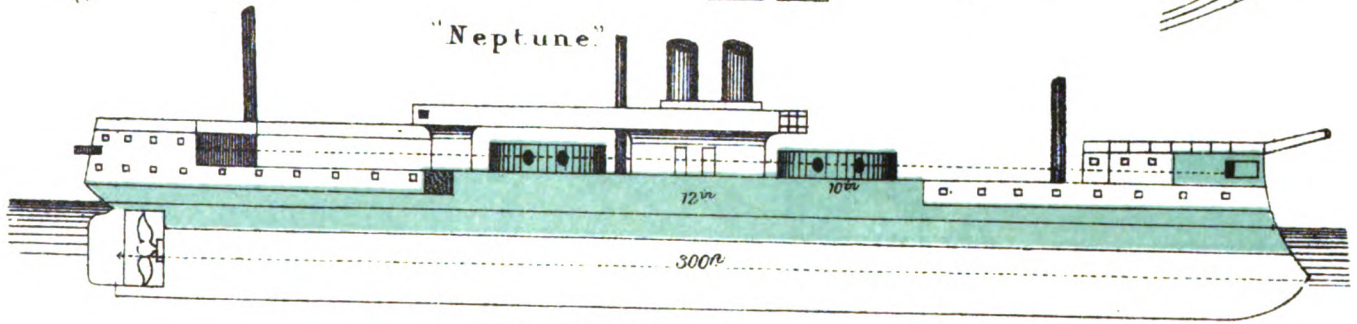
HANHART LITH.

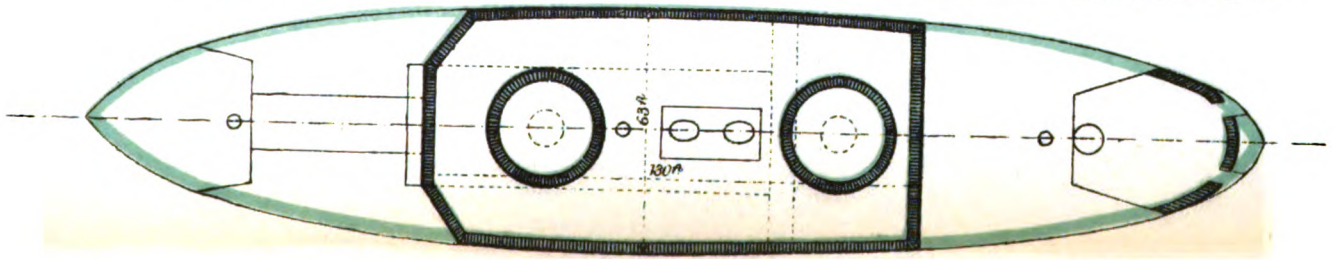
"Nelson"
"Northampton"





"Neptune"





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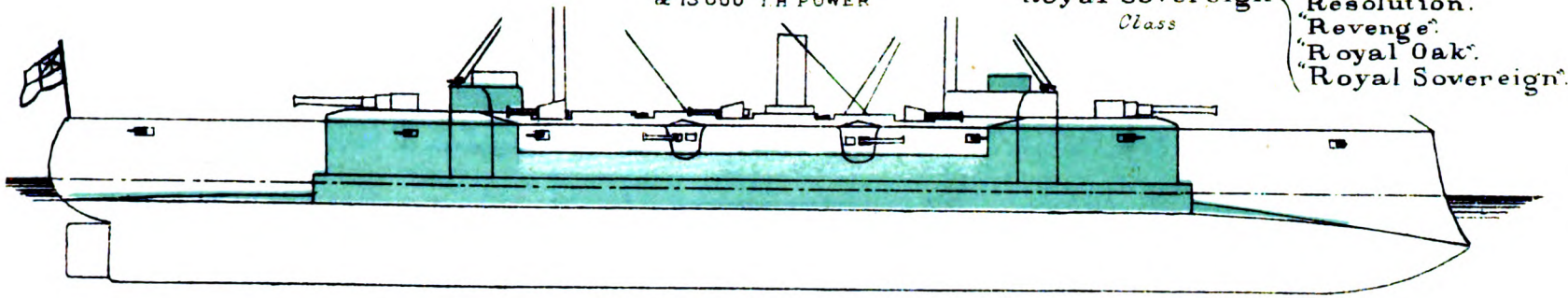
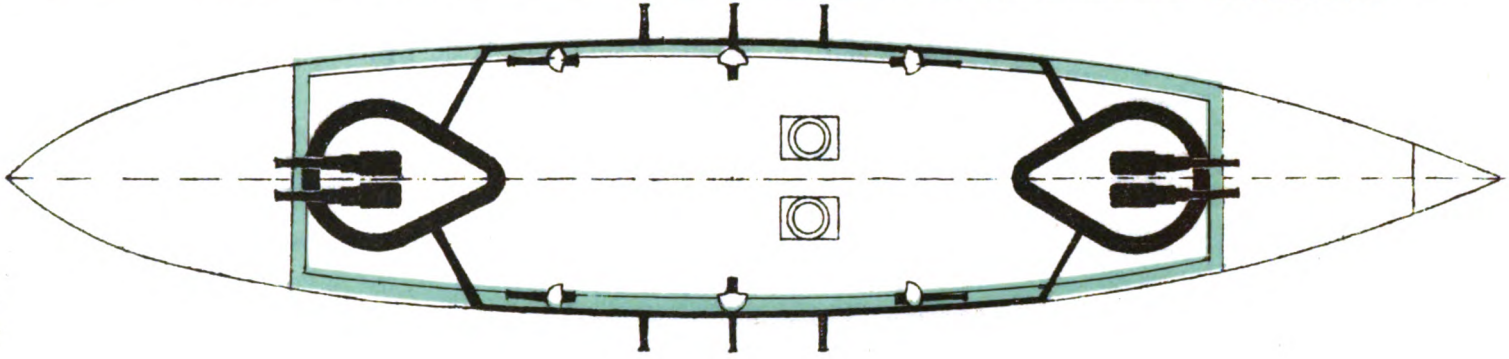
"Royal Sovereign".

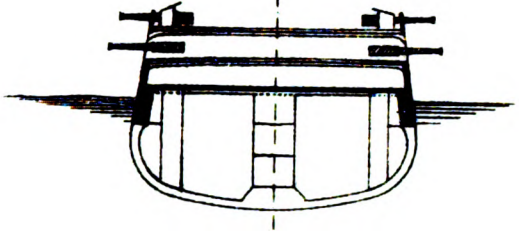
of 14150 TONS DISPLACEMENT
& 13000 I.H.P. POWER

"Royal Sovereign" Class

- "Ramillies".
- "Renown".
- "Repulse".
- "Resolution".
- "Revenge".
- "Royal Oak".
- "Royal Sovereign".







(On Special Scale)

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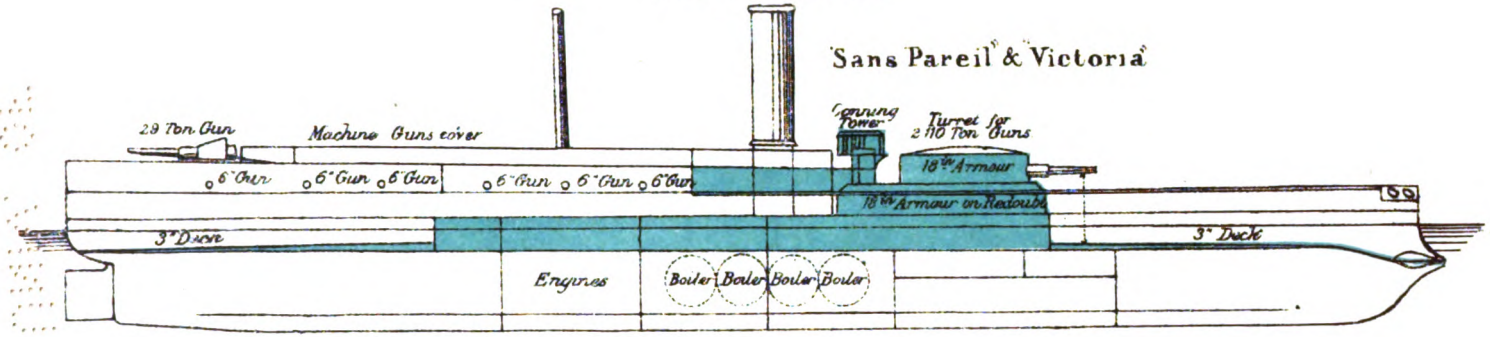
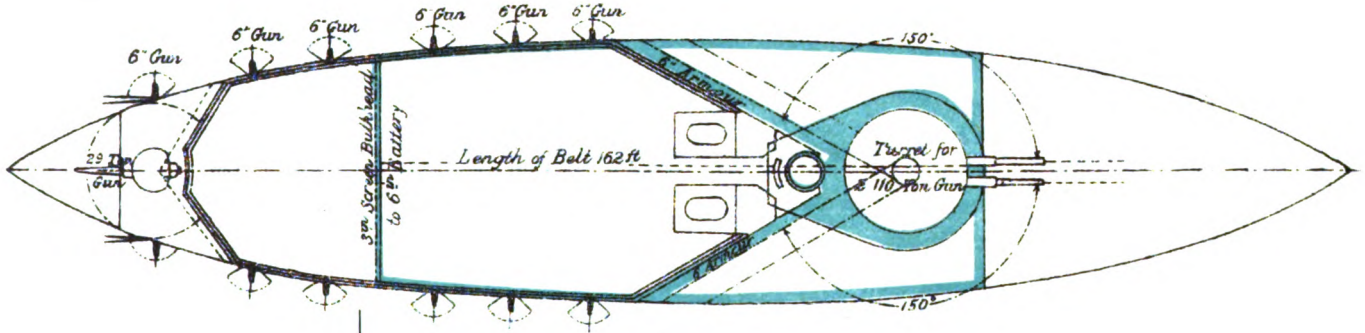
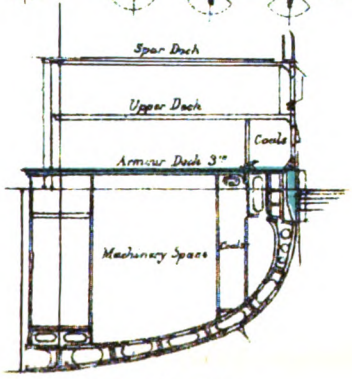
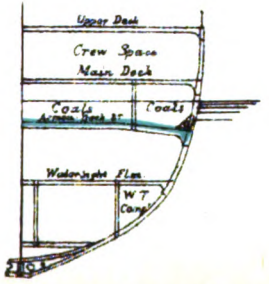
Sans Pareil & Victoria







Midship Section



Section before turret

HANHART LITH

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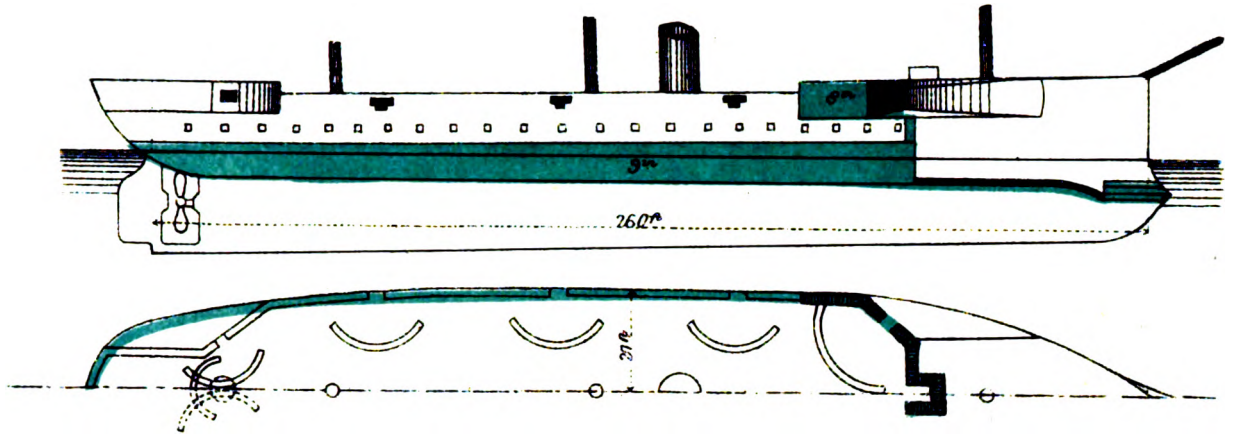
BRITISH SHIPS.

"Shannon."



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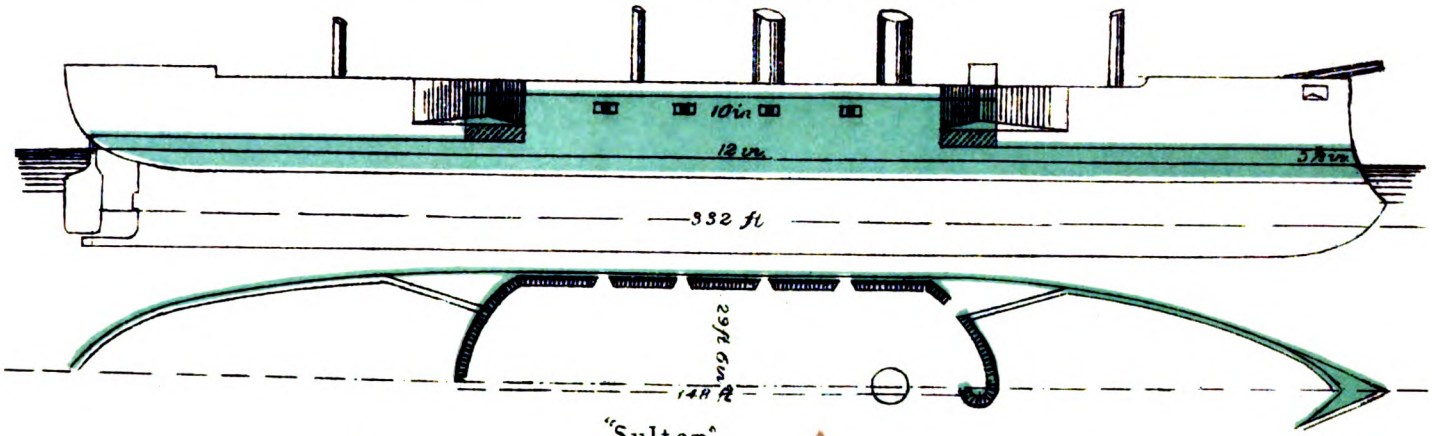
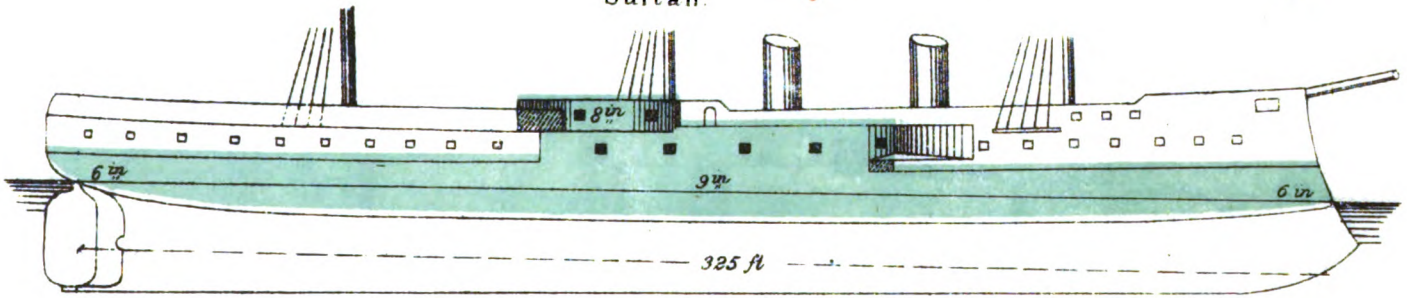
HANHART LITH.

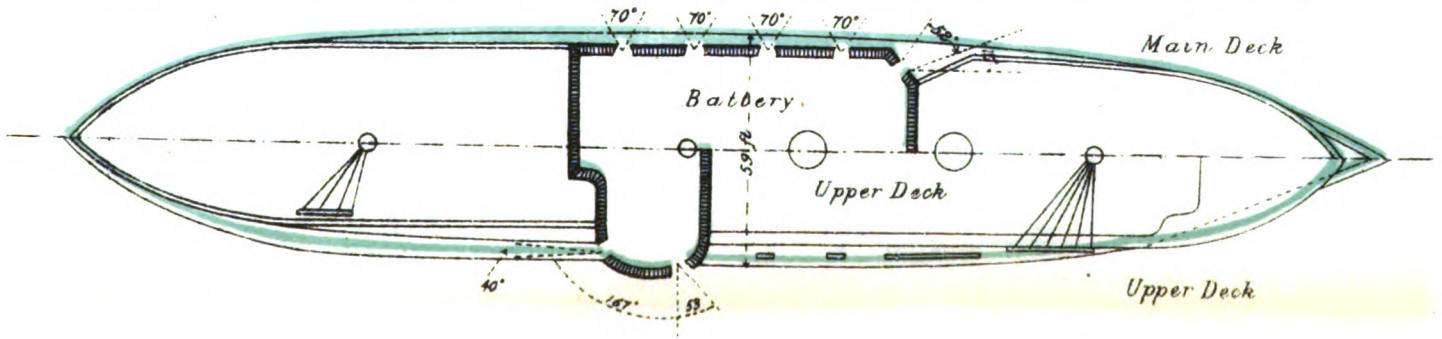
"Superb" & Turkish Ship "Mesoodieh"

Pl. 28.



"Sultan"





HANHART LITH

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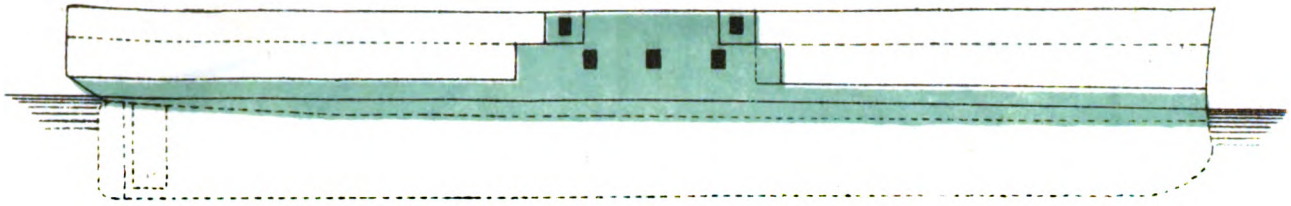
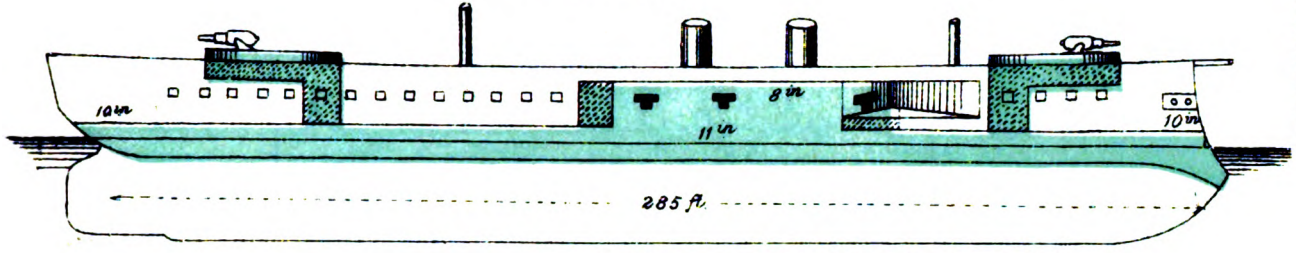
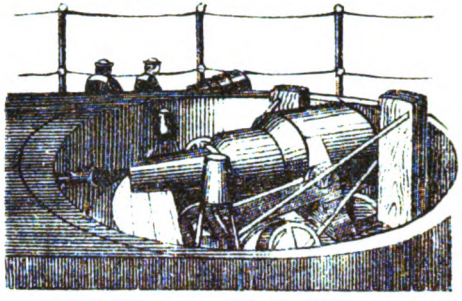
"Swiftsure" & "Triumph"



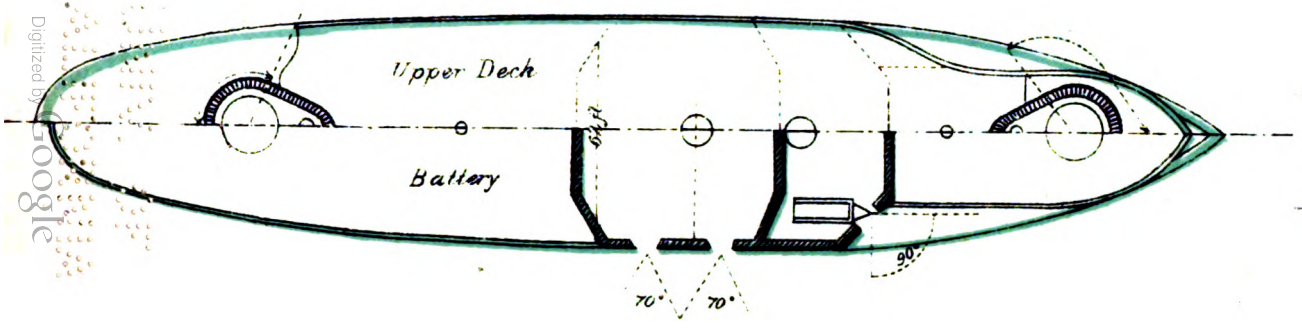
BRITISH SHIPS

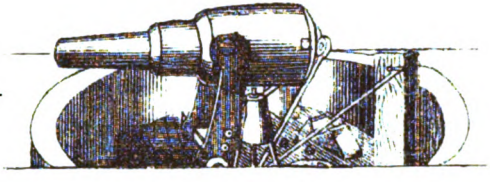
"Téméraire"





Téméraire's Gun, loading position.





Téméraire's Gun firing position

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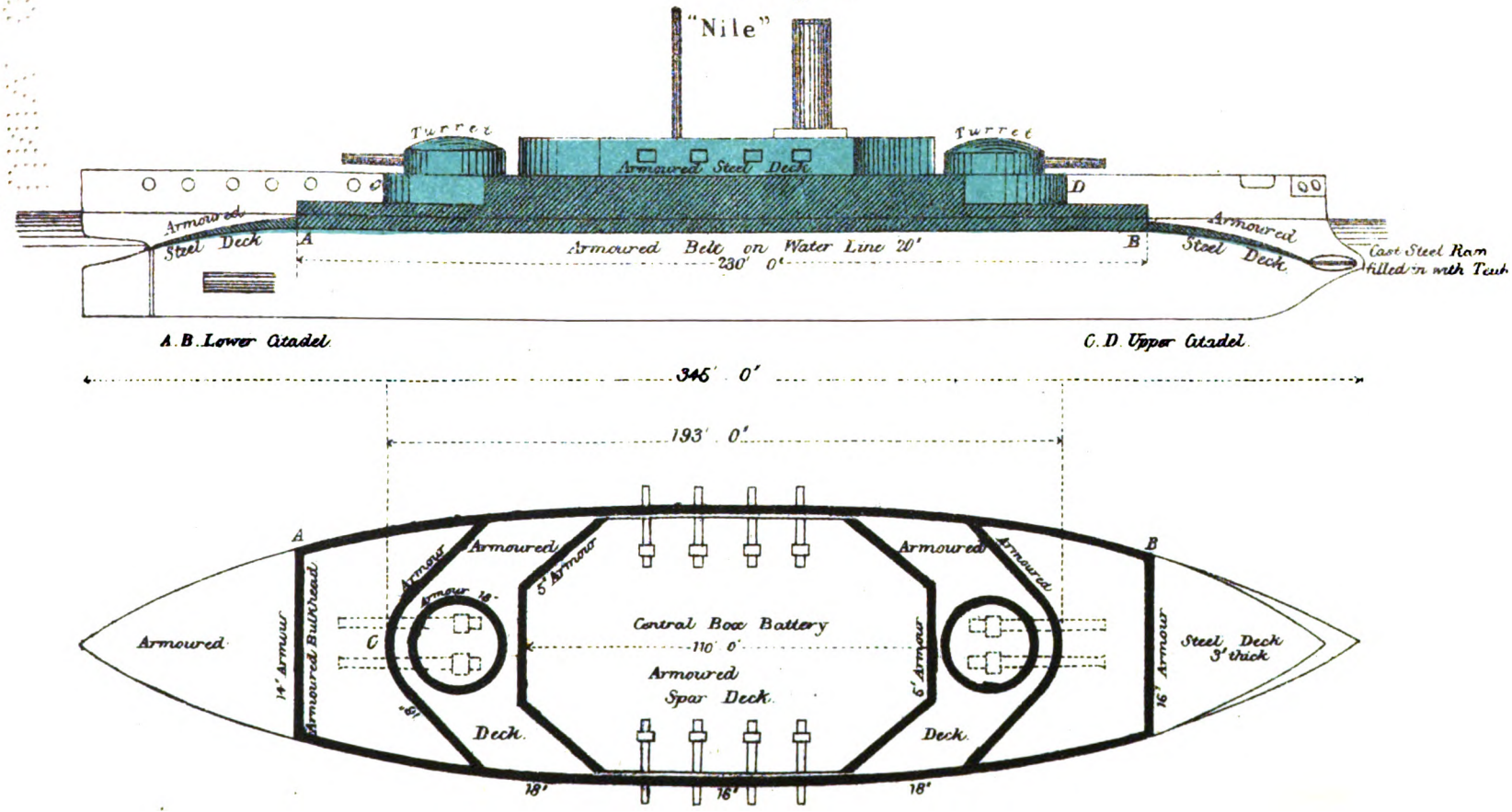
"Trafalgar"

"Nile"



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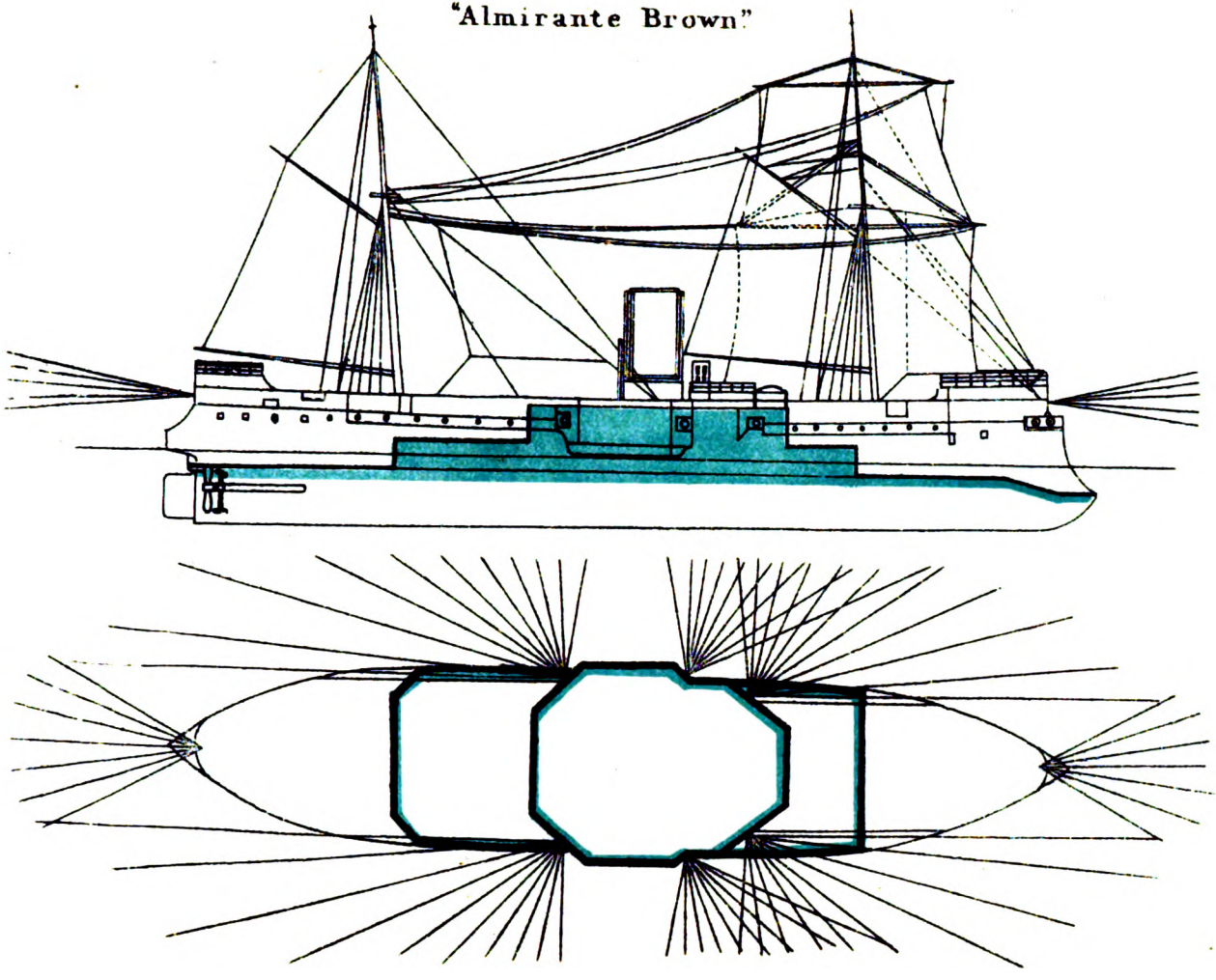
HANHART LITH.

"Almirante Brown"



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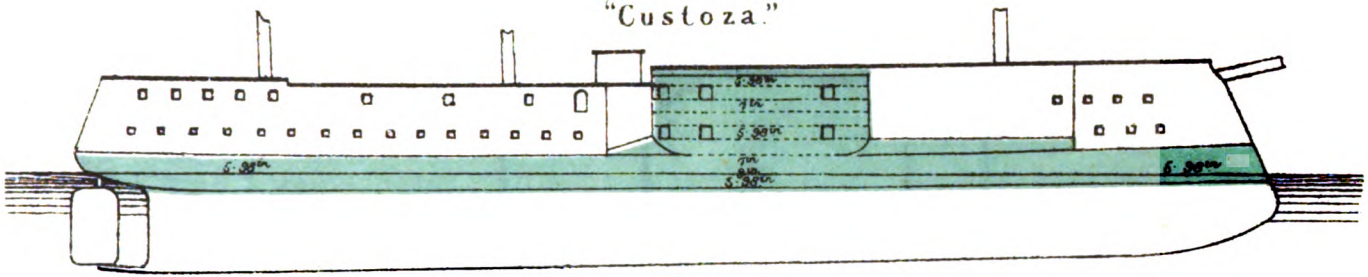
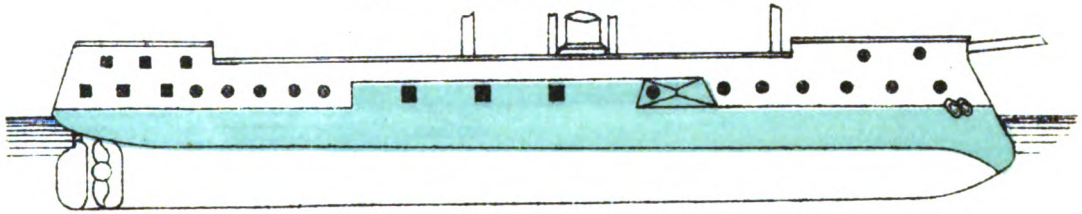
"Custoza."

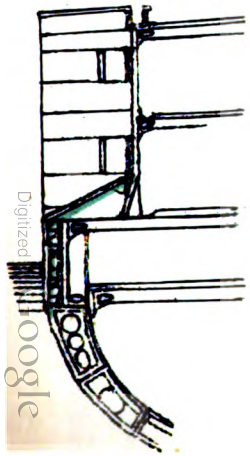


"Don Juan" de Austria.

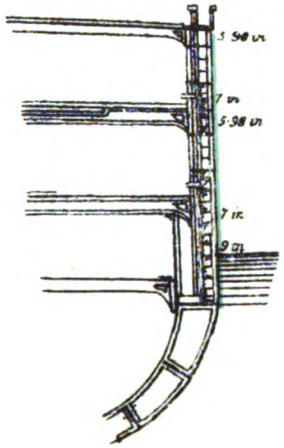


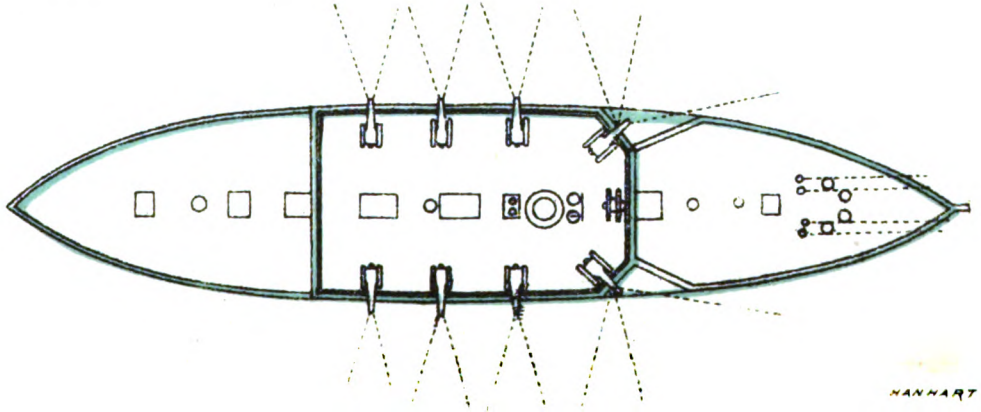
"Custoza."

Before the Battery



in the Battery.





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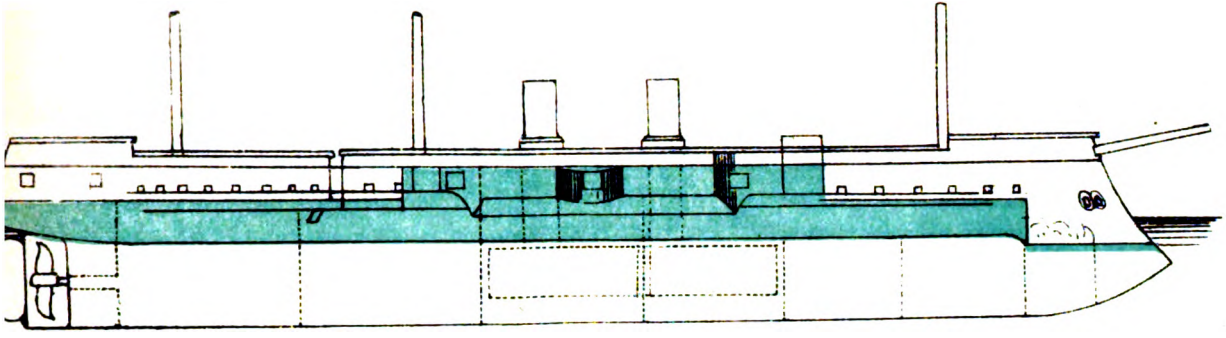
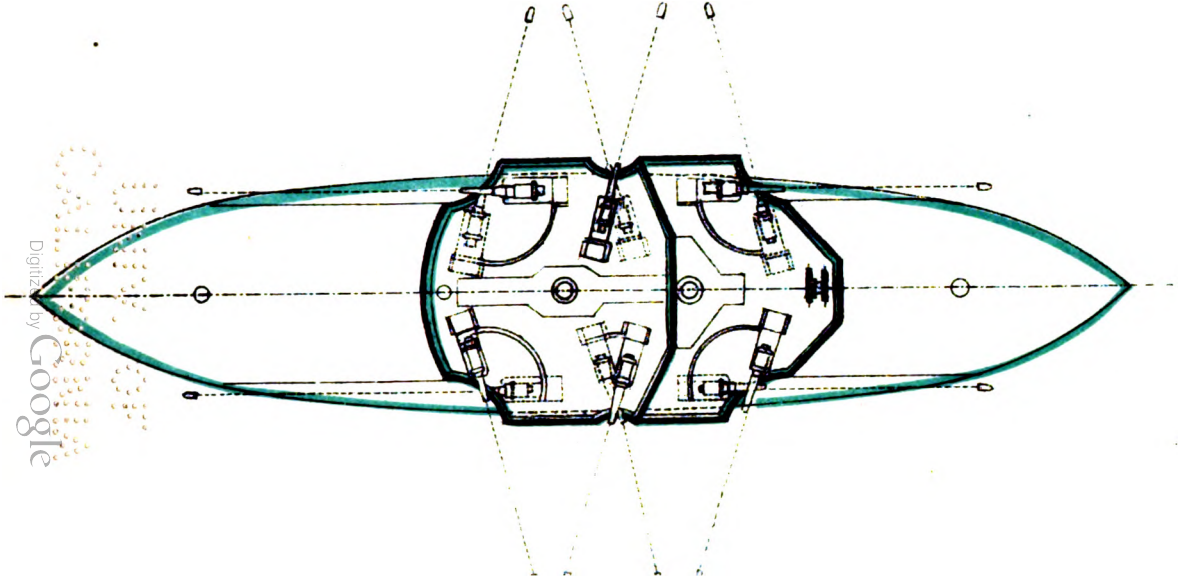
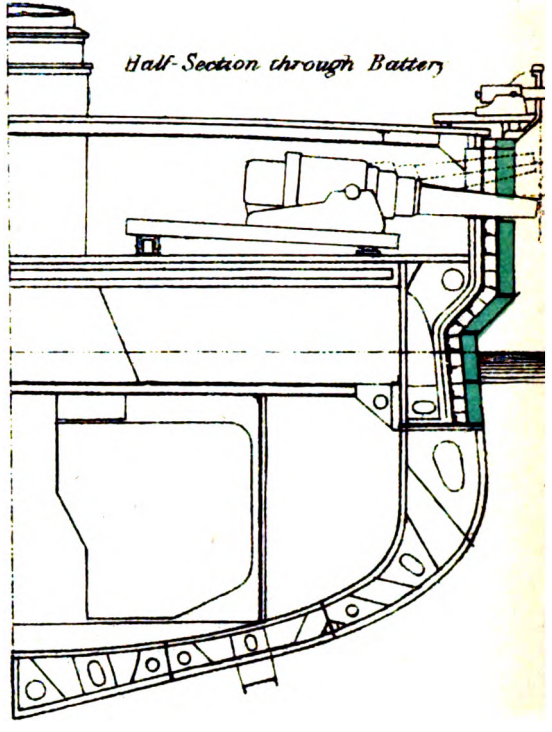
AUSTRIAN SHIPS

Pl. 33

"Tegetthoff"







HANHART LITH

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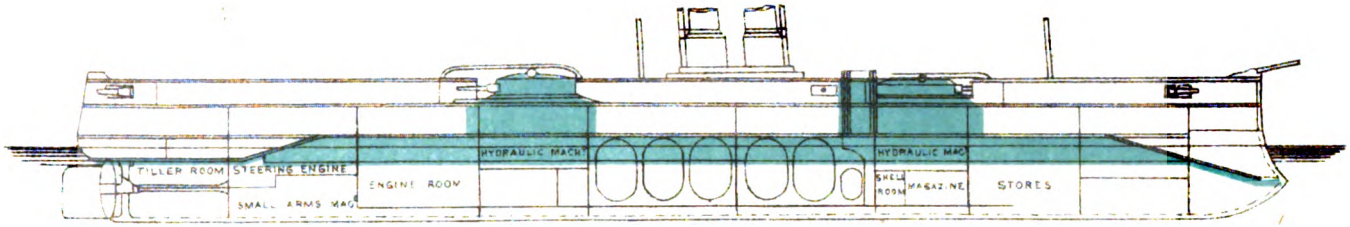
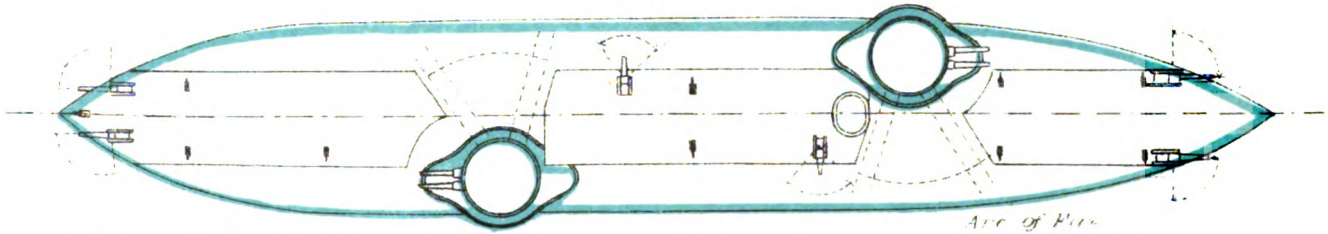
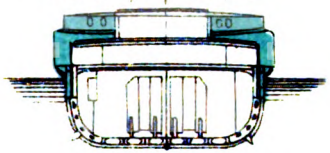
"Riachuelo."



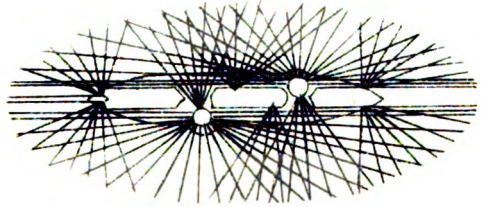
Plan of Upper Deck



Midship Section



Arc of Fire



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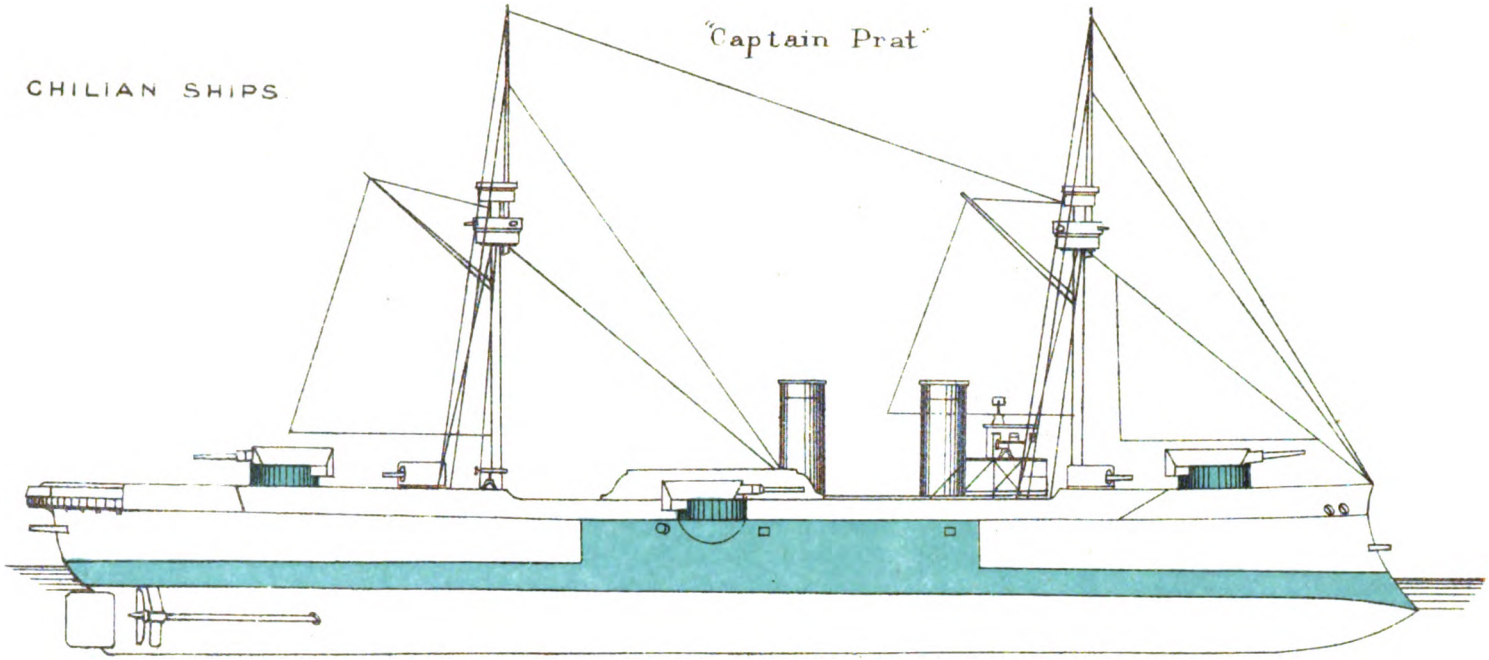
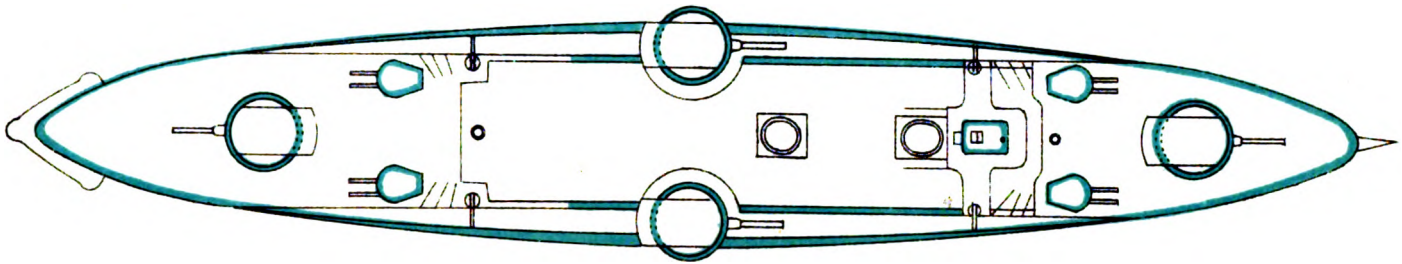
HANHART LITH.

CHILIAN SHIPS.

"Captain Prat"

Pl. 35.





HANHART LITH

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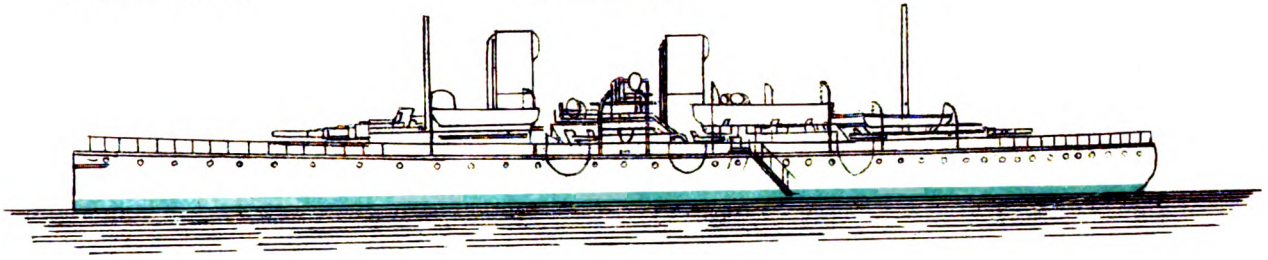
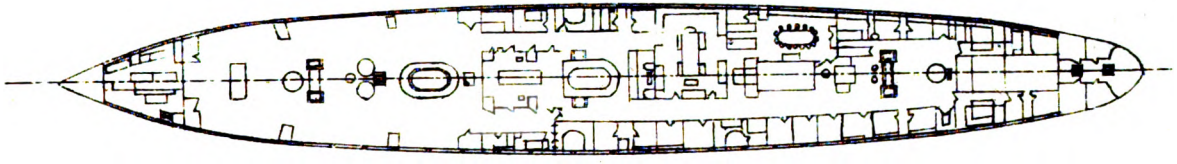
CHILIAN SHIPS

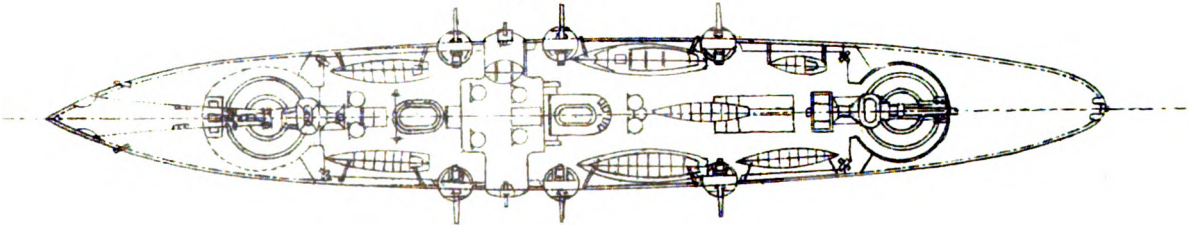
"Esmeralda"



Main Deck



Upper Deck



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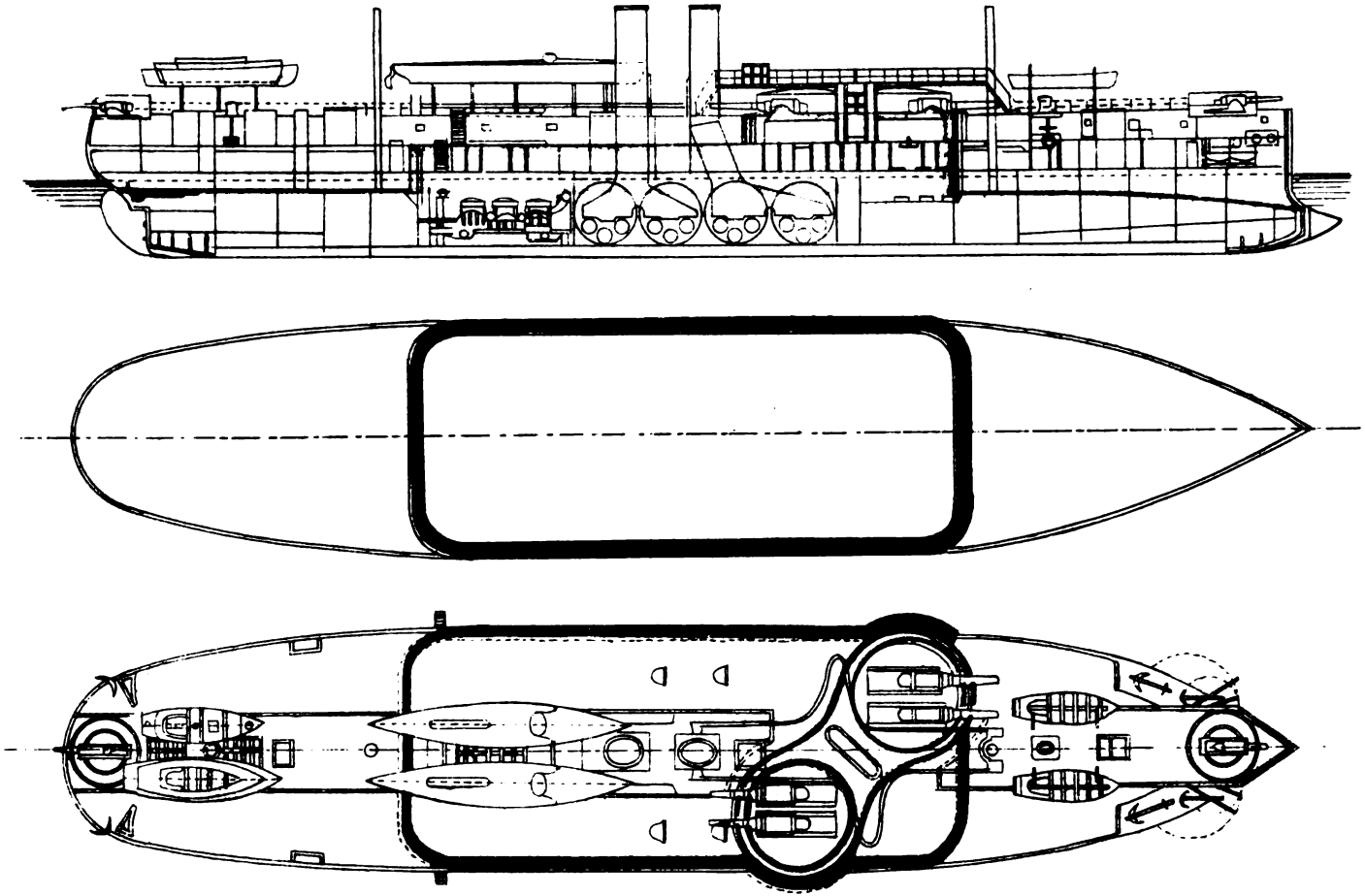
"Ting Yuen" & "Chen Yuen"



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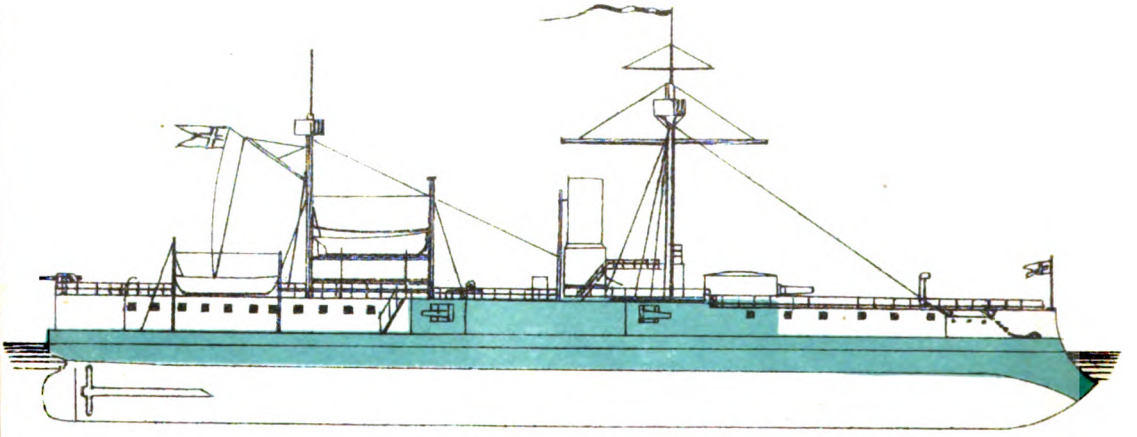
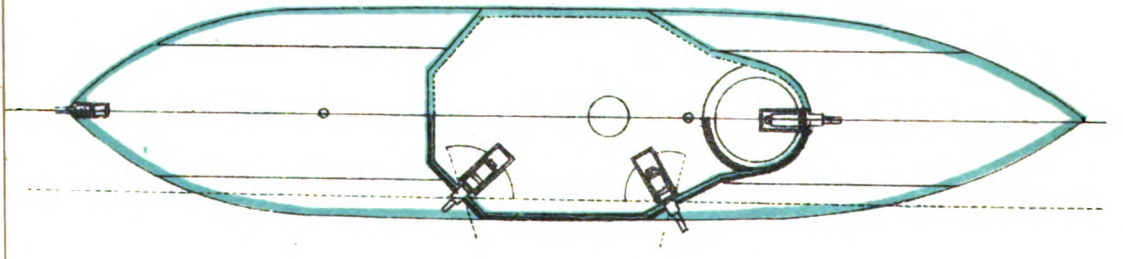
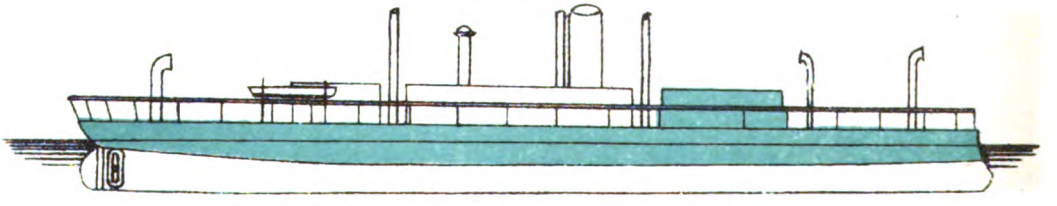
DANISH SHIPS

"Helgoland"





"Gorm"



UNIV. OF CALIFORNIA

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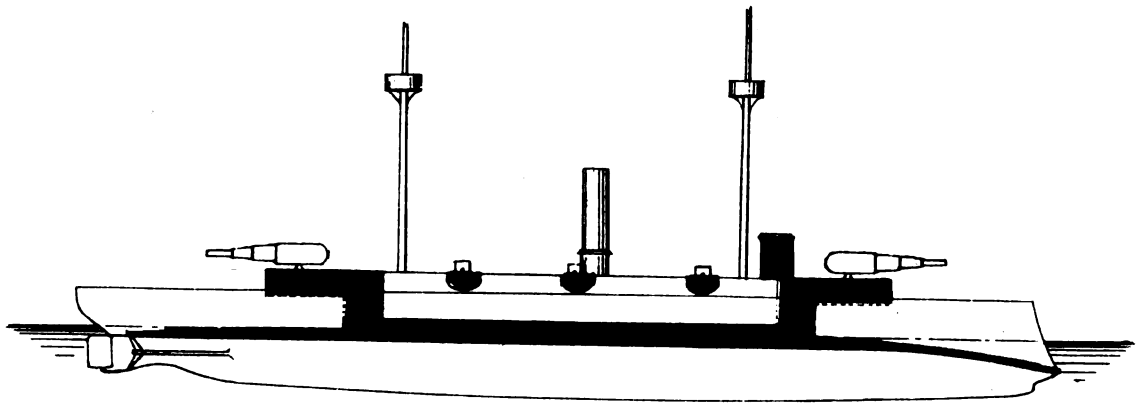
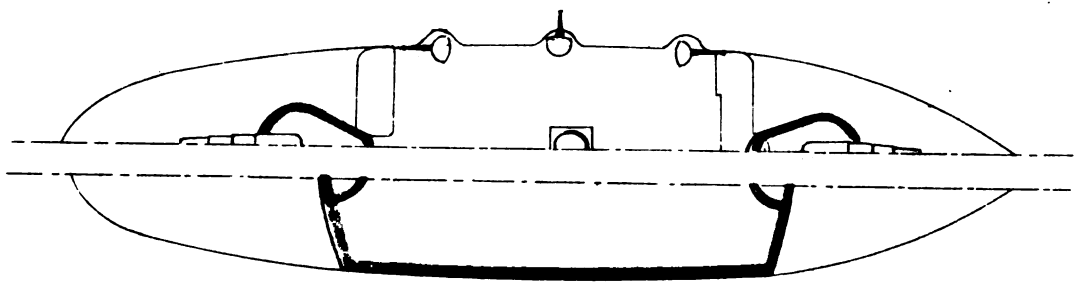
Iver Hvitfeld.



Upper Deck



Armoured Deck

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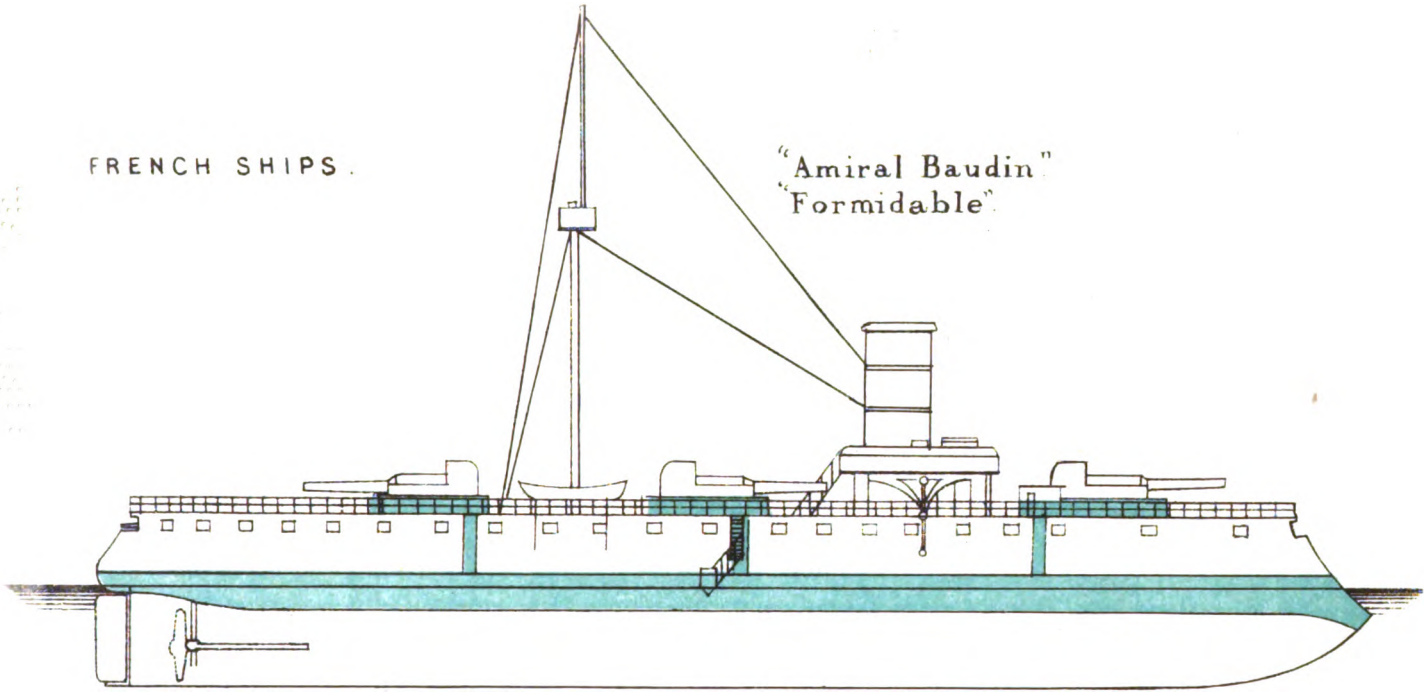
FRENCH SHIPS.

"Amiral Baudin"
"Formidable"



HANNART LITH

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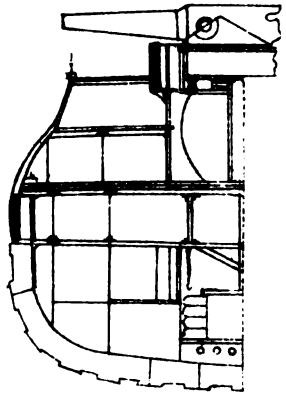
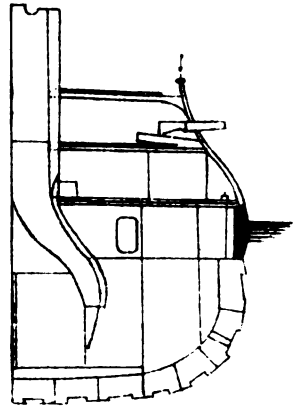
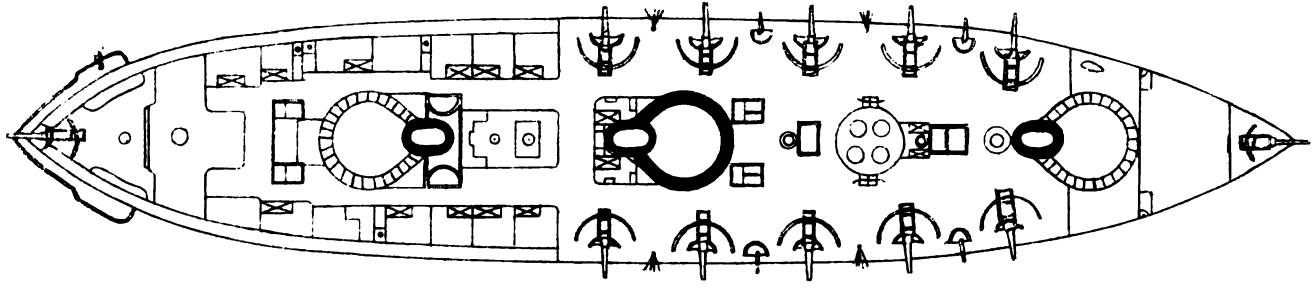


"Amiral Baudin"
Formidable.





Plan of Secondary Battery.

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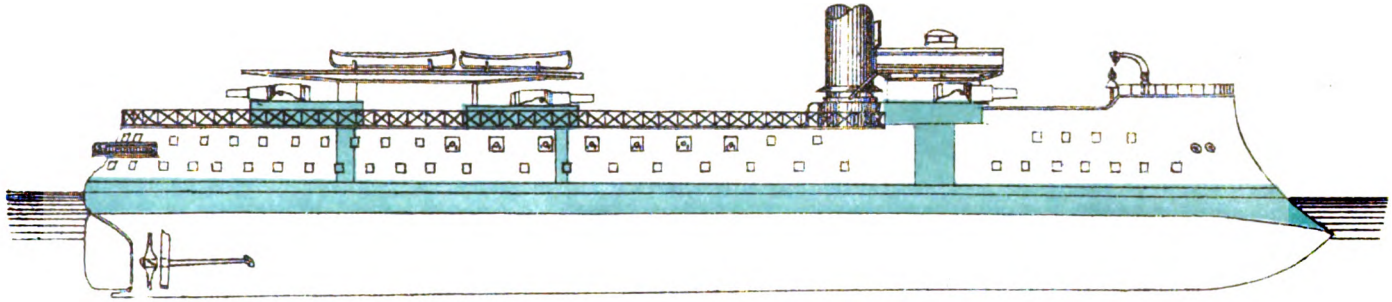
FRENCH SHIPS

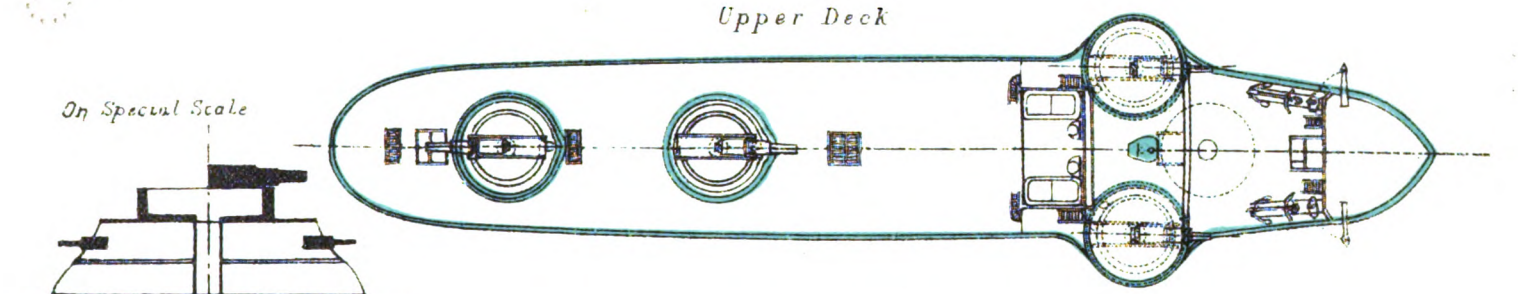
Amiral Duperre

Pl 42

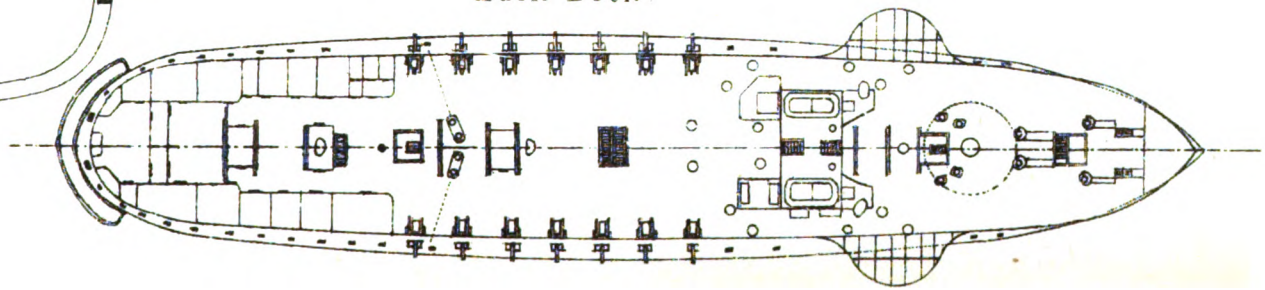


Upper Deck

On Special Scale



Main Deck



HANHART LITH.

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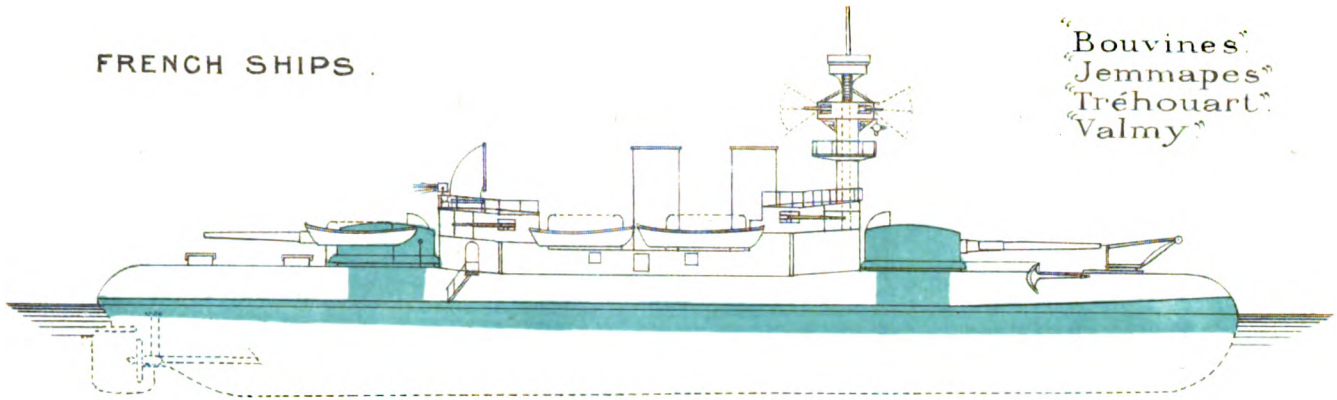
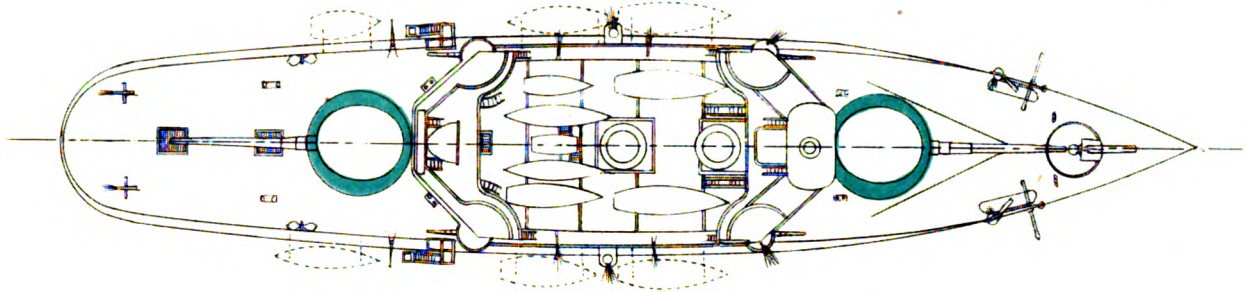
FRENCH SHIPS.

"Bouvines"
"Jemmapes"
"Tréhouart"
"Valmy"

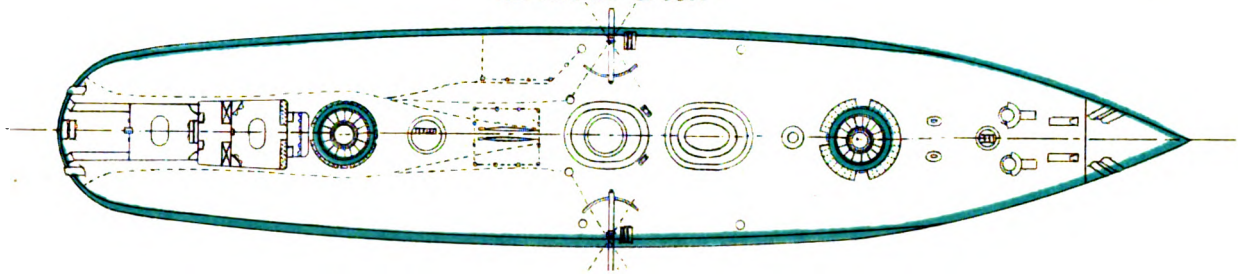
Pl 43



Upper Deck



Armour Deck



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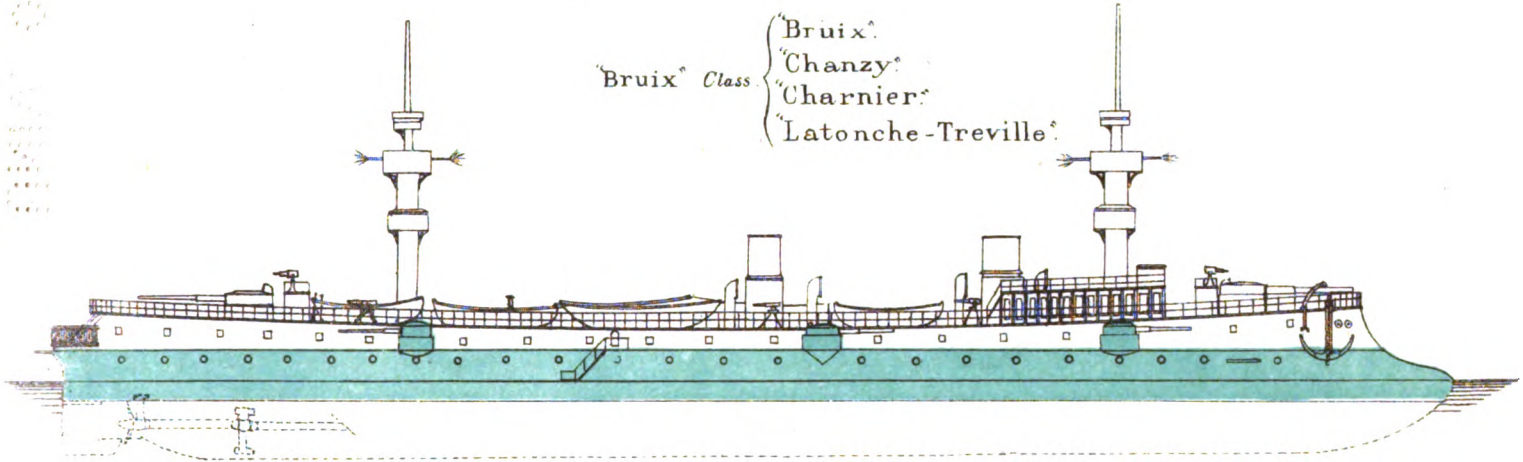
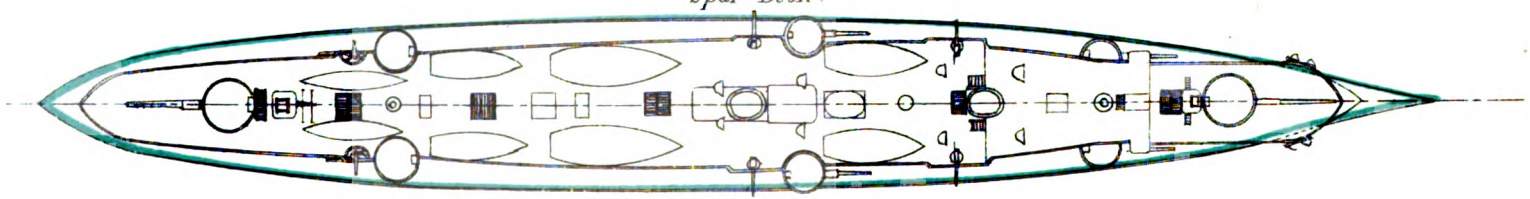
FRENCH SHIPS.

"Bruix" Class { "Bruix" / "Chanzy" / "Charnier" / "Latonche-Treville" }



Spar Deck



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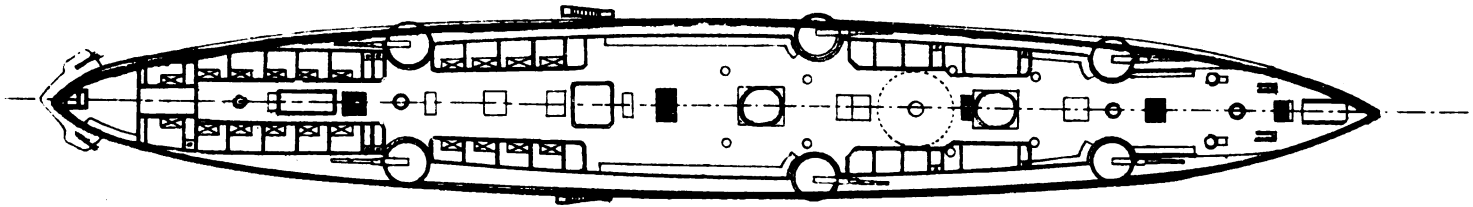
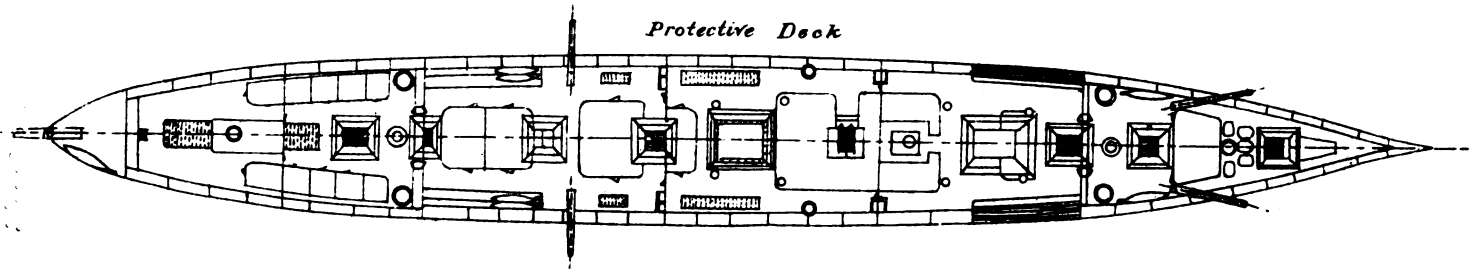
FRENCH SHIPS.

"Bruix" Class. { "Bruix" / "Chanzy" / "Charnier" / "Latouche-Tréville" }

Upper Deck.



Protective Deck



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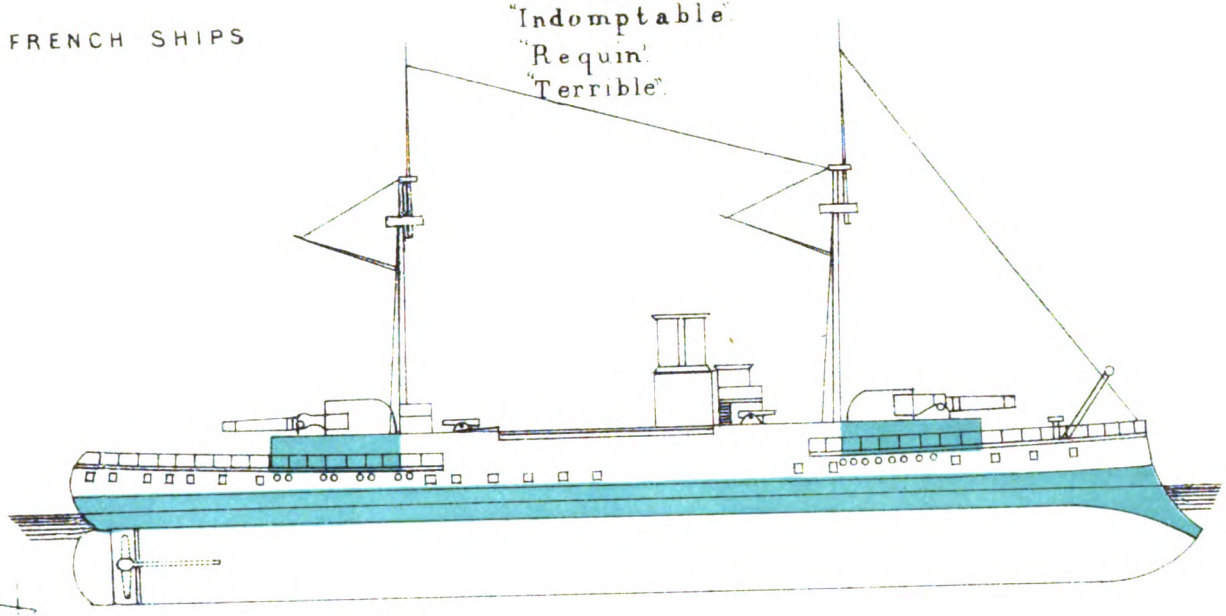
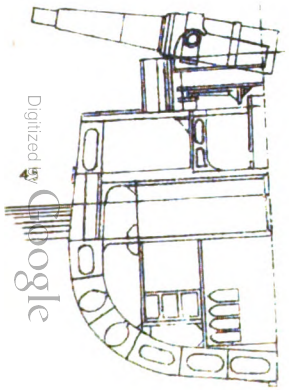
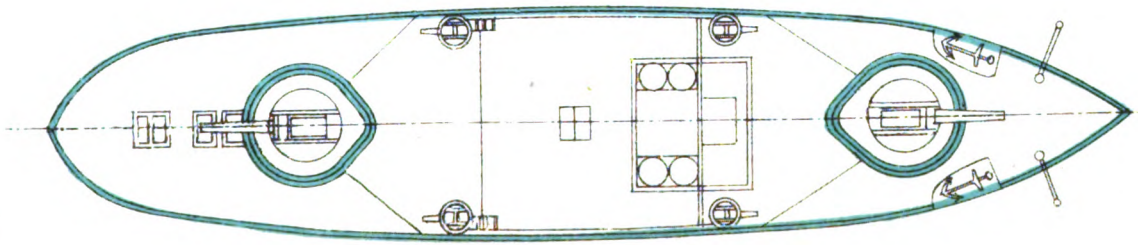
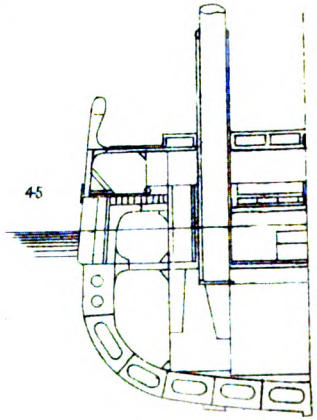
FRENCH SHIPS

"Caiman"
"Indomptable"
"Requin"
"Terrible"









45

HAVHART LITH

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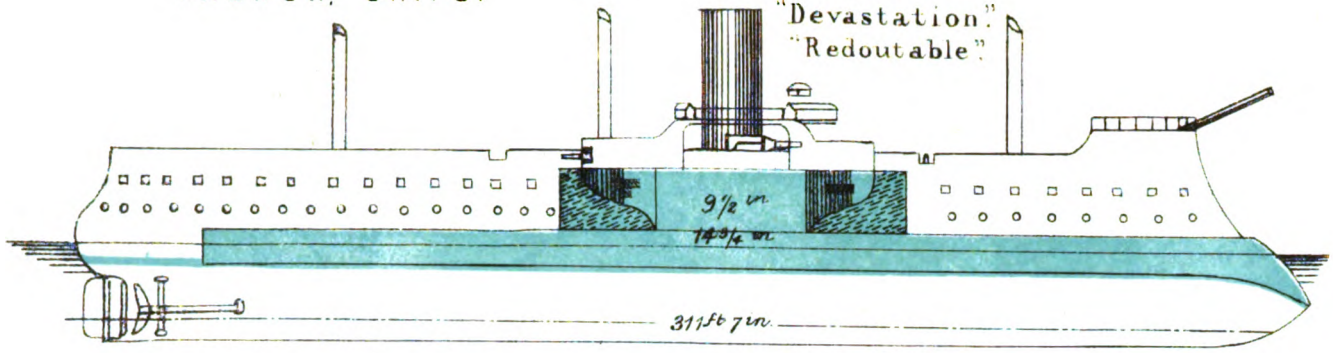
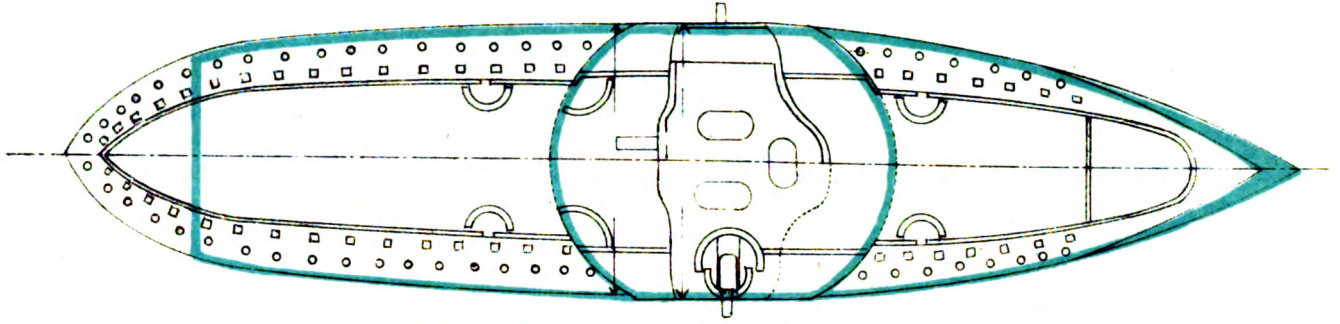
FRENCH SHIPS.

"Courbet".
"Devastation".
"Redoutable".

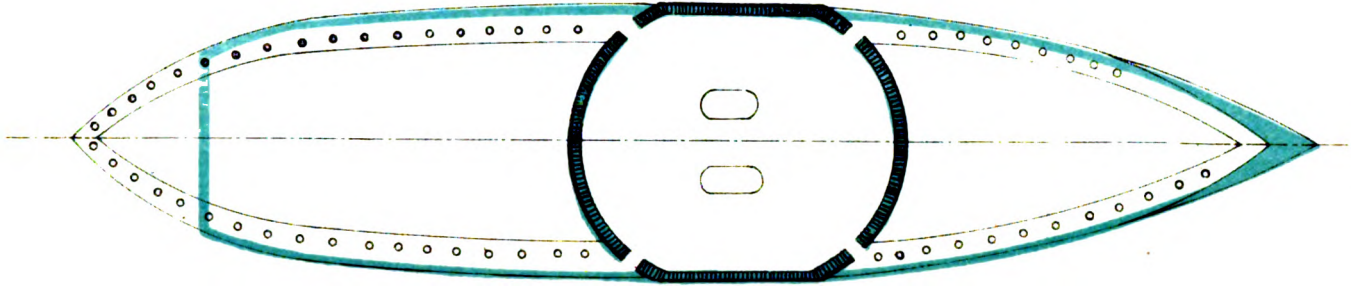
Pl. 47.



Upper Deck.



Main Deck.



HANHART LITH

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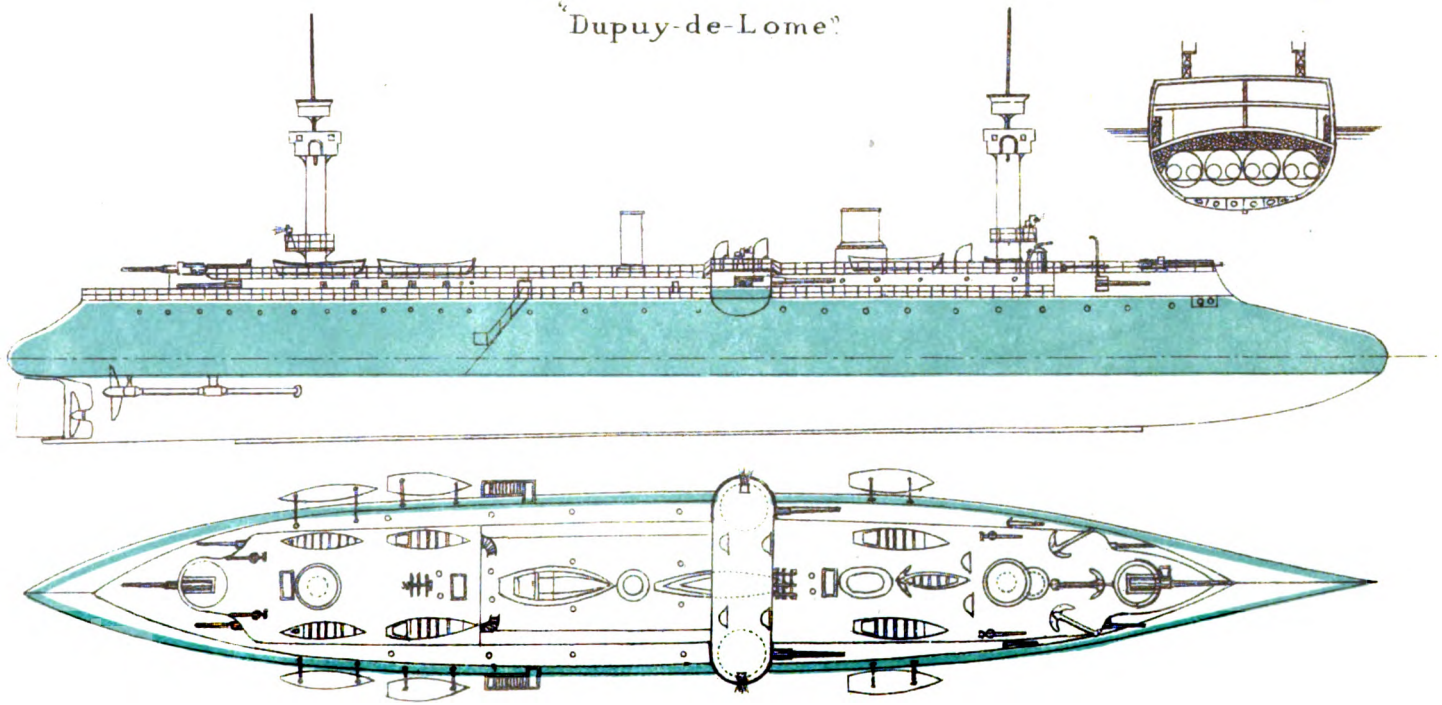
FRENCH SHIPS.

Armoured Cruiser.

"Dupuy-de-Lome"



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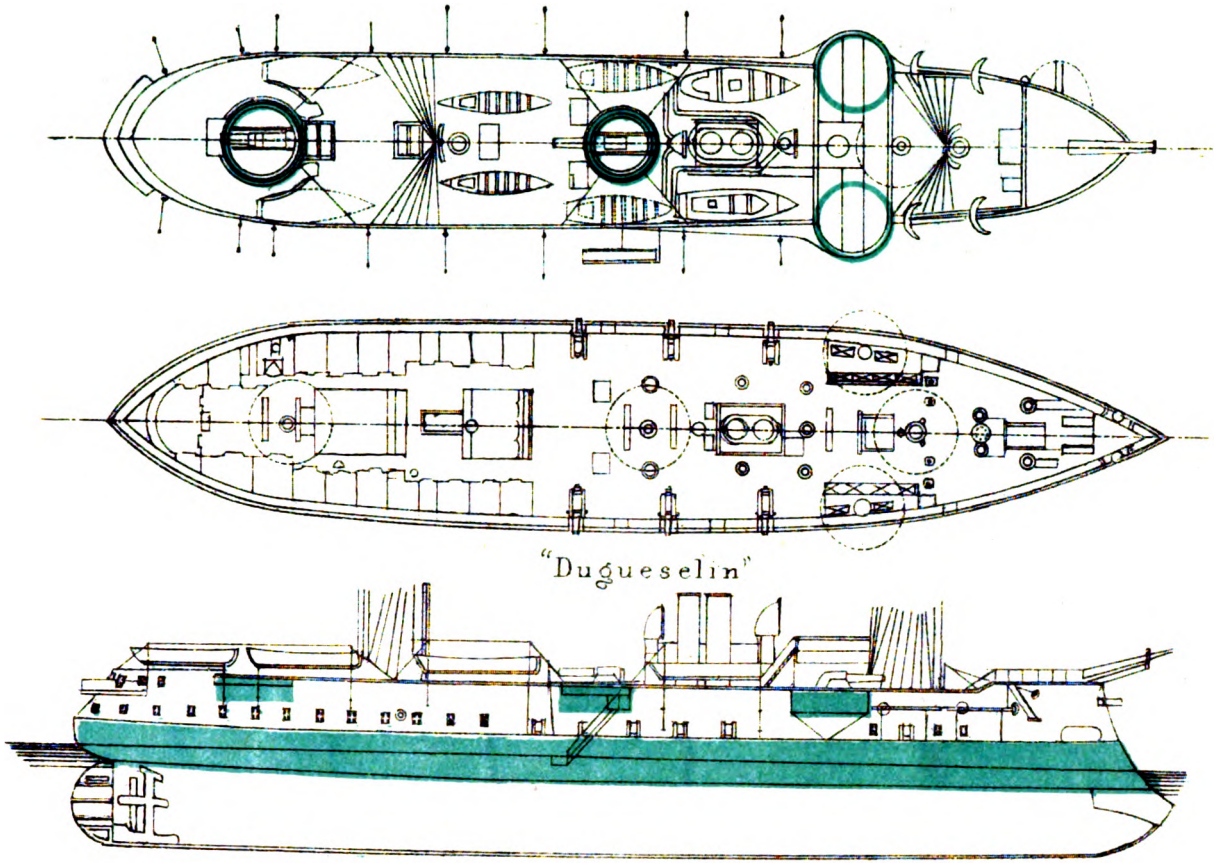
FRENCH SHIPS.



"Dugueselin"

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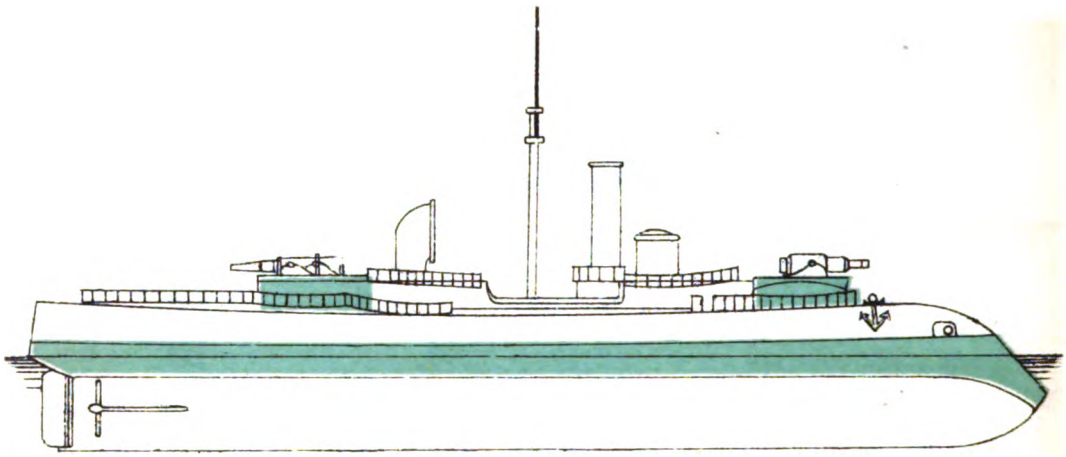
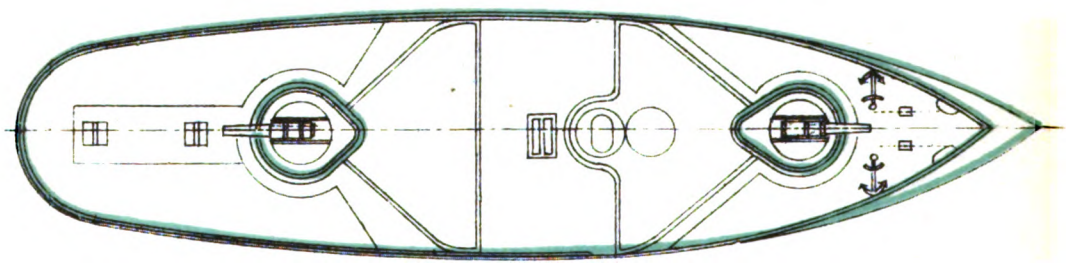
HANHART. LITH

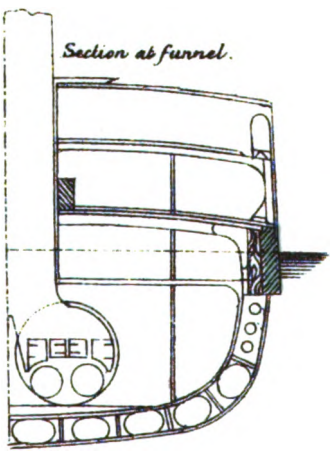
FRENCH SHIPS.

"Furieux"

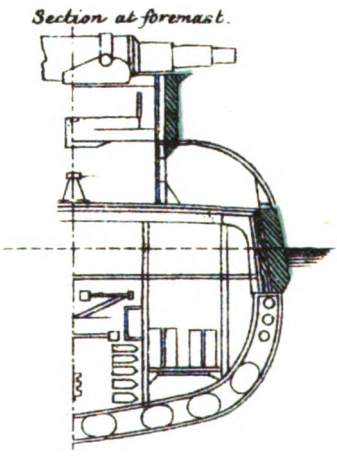




Section at funnel.



Section at foremast.



HANHART LITH.

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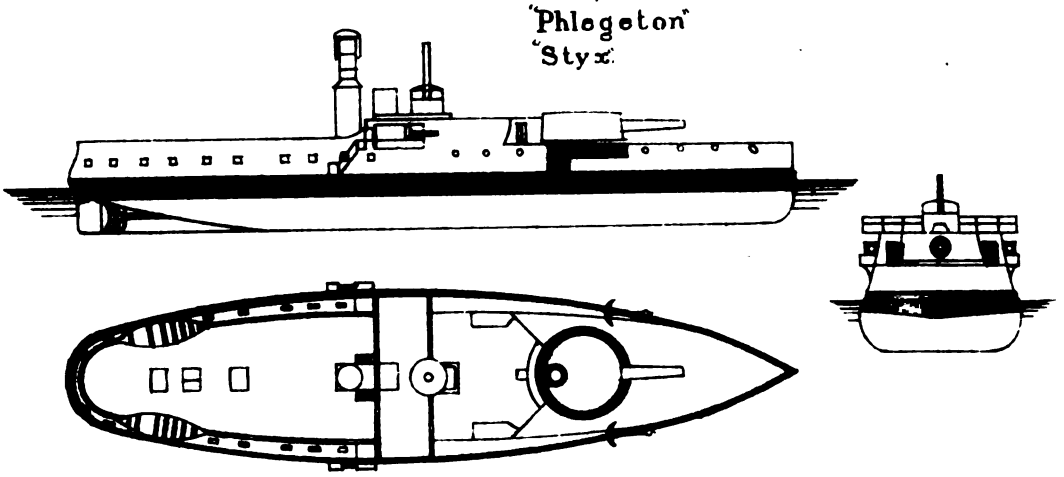
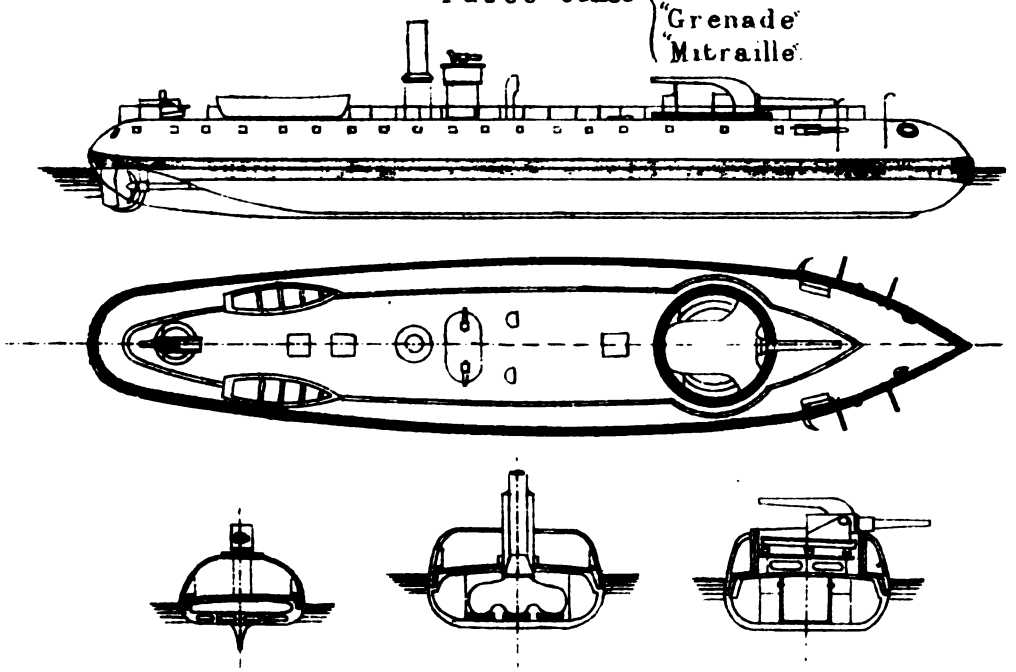
FRENCH SHIPS

"Acheron"
"Cocyte"
"Phlegeton"
"Styx"



"Fusée" *Class* {"Flamme" "Fusée" "Grenade" "Mitraille"}



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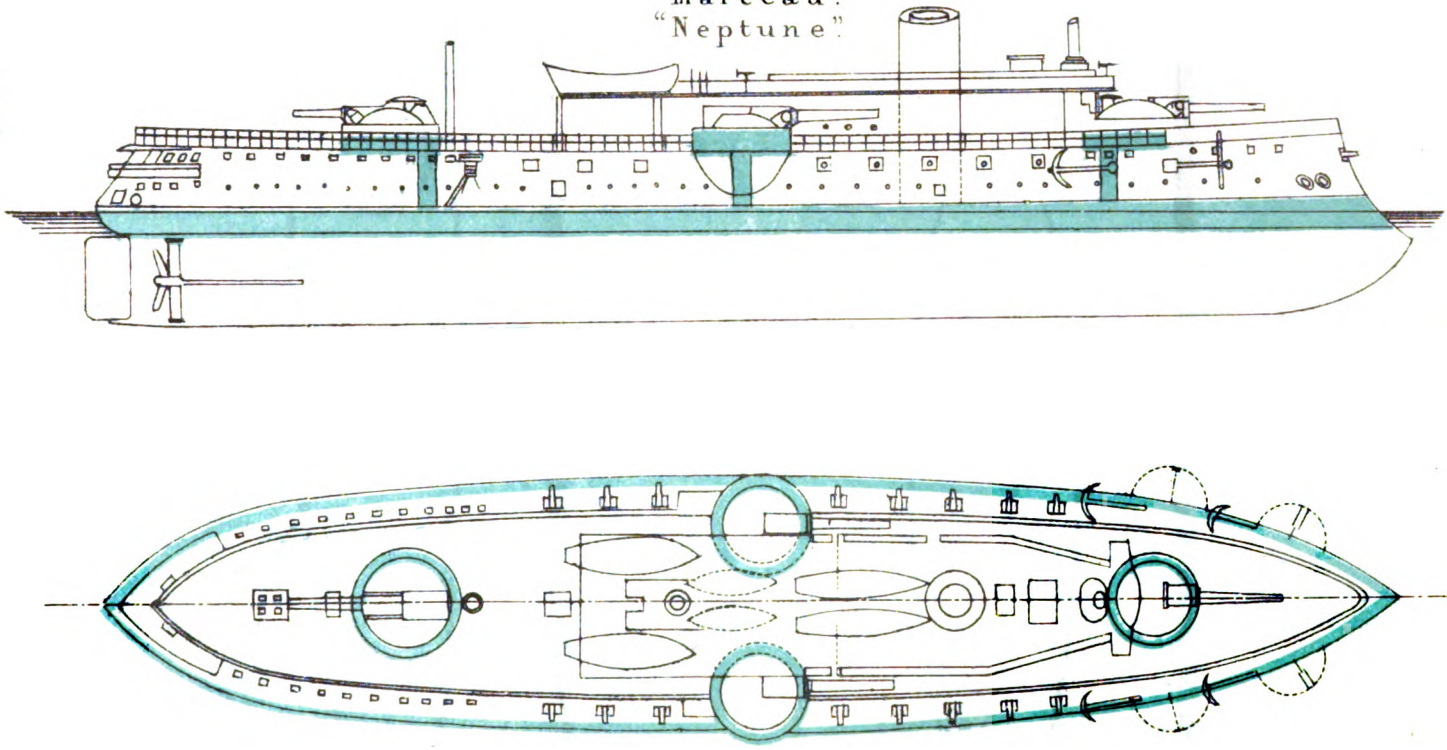
FRENCH SHIPS.

"Hoche".
"Magenta".
"Marceau".
"Neptune".



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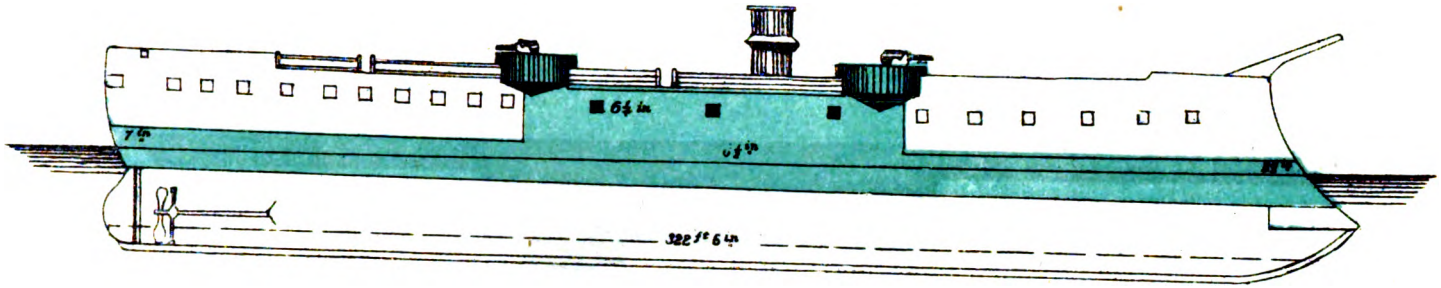
HANHART LITH

FRENCH SHIPS.

"Richelieu"



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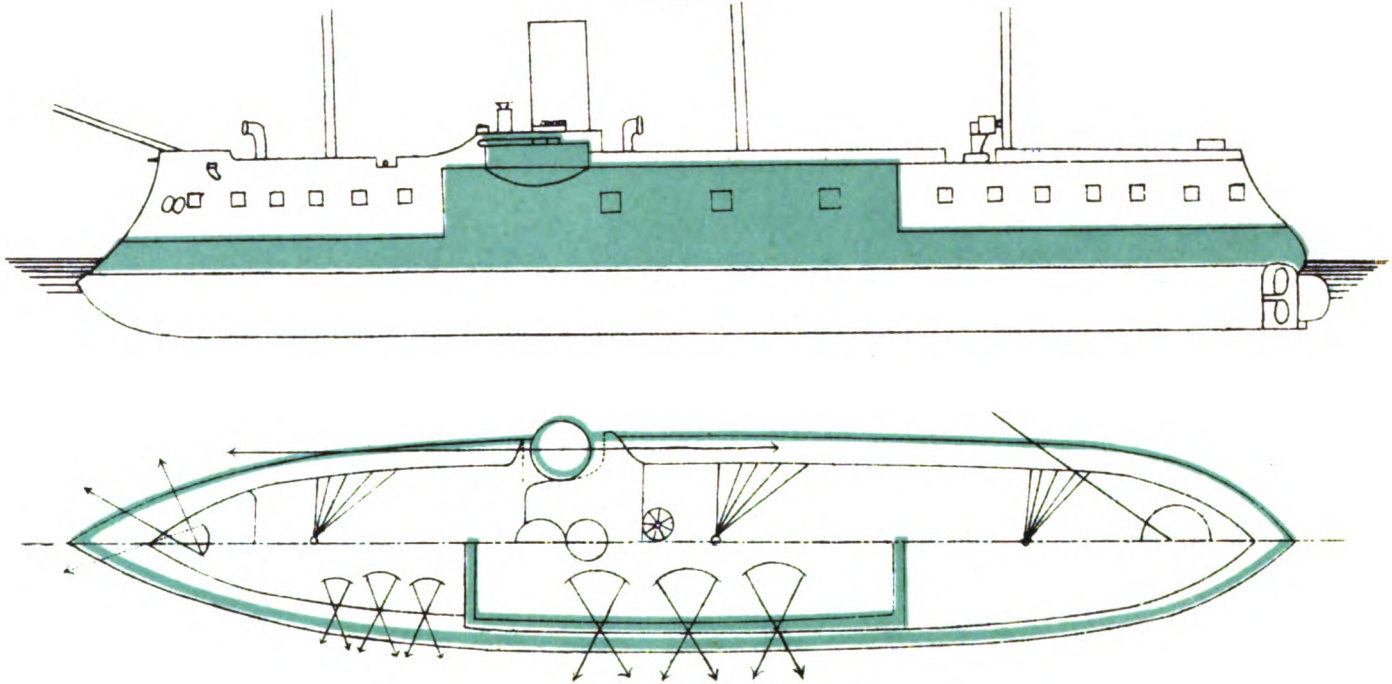
FRENCH SHIPS.

"Trident"
"Colbert"



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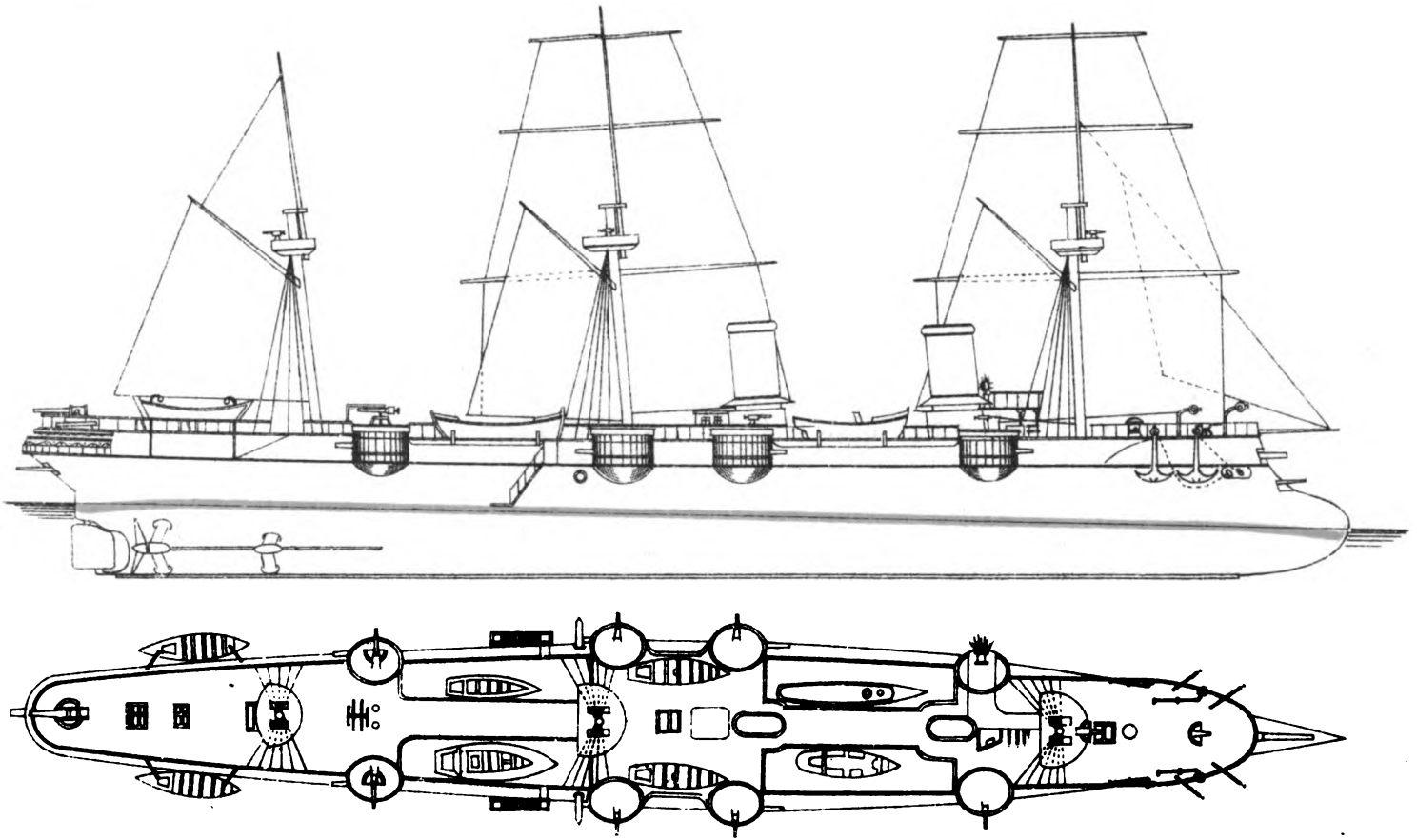
MANHART LITH

FRENCH SHIPS

Protected Cruiser
"Alger"

Pl. 55.



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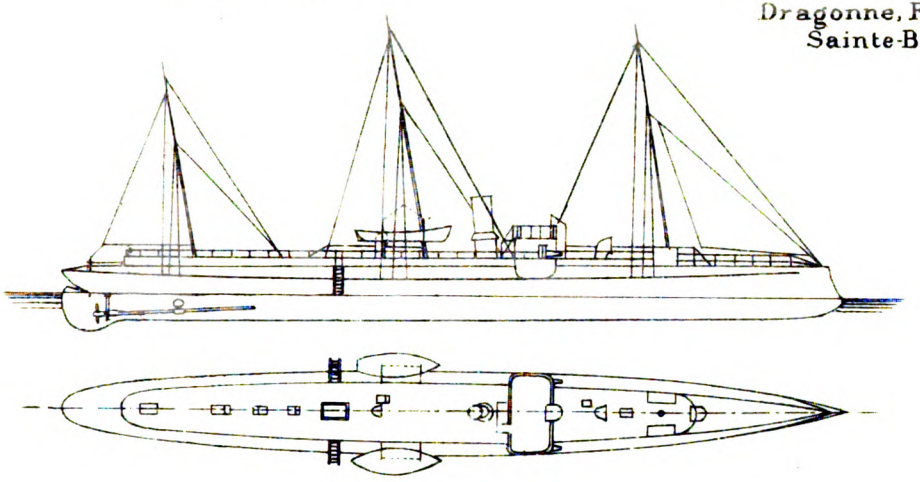
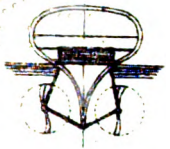
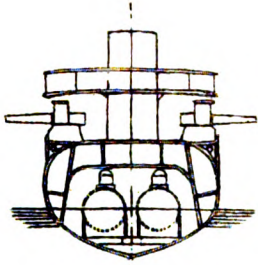
HANNART LITH

"Bombe, Couleuvrine, Dague."
Dragonne, Flèche, Lance,
Sainte-Barbe. Salve.

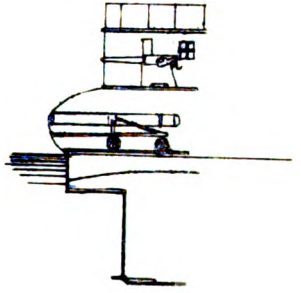




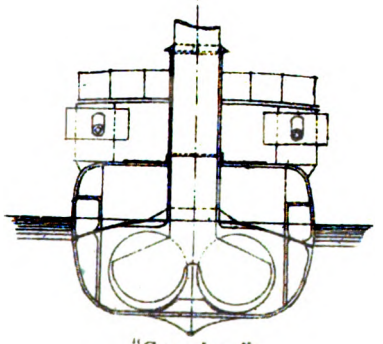
Section on A B



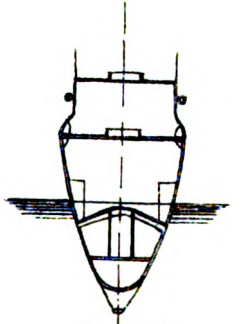
Section on E B.



Aft.



"Condor"
Before the Engine Room.



Forward.

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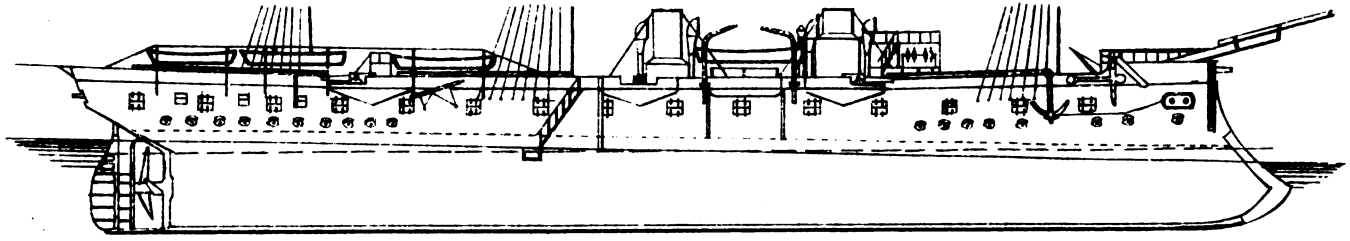
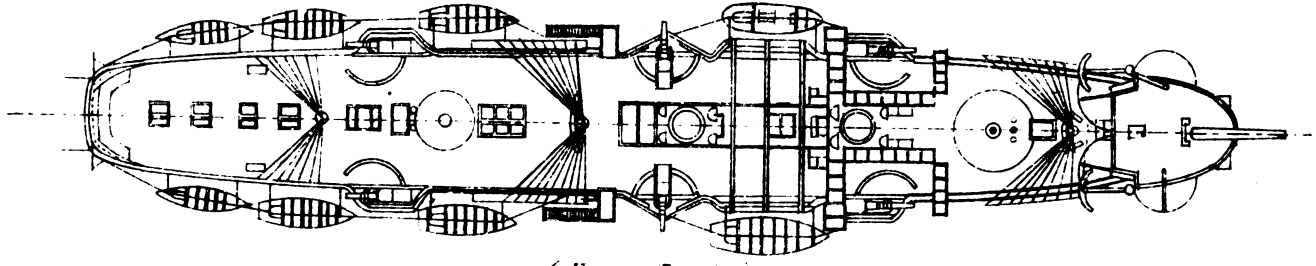
HANHART LITH.

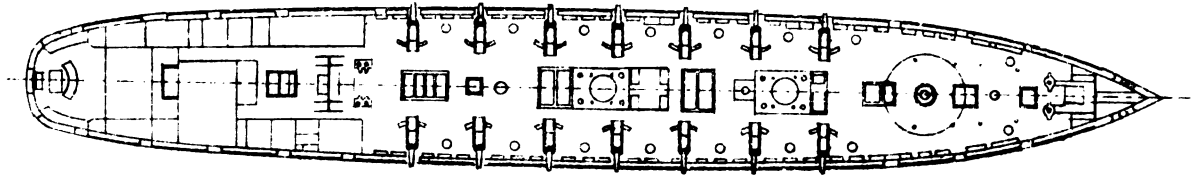
"Duquesne"



(On Special Scale)



(Upper Deck)



(Main Deck)

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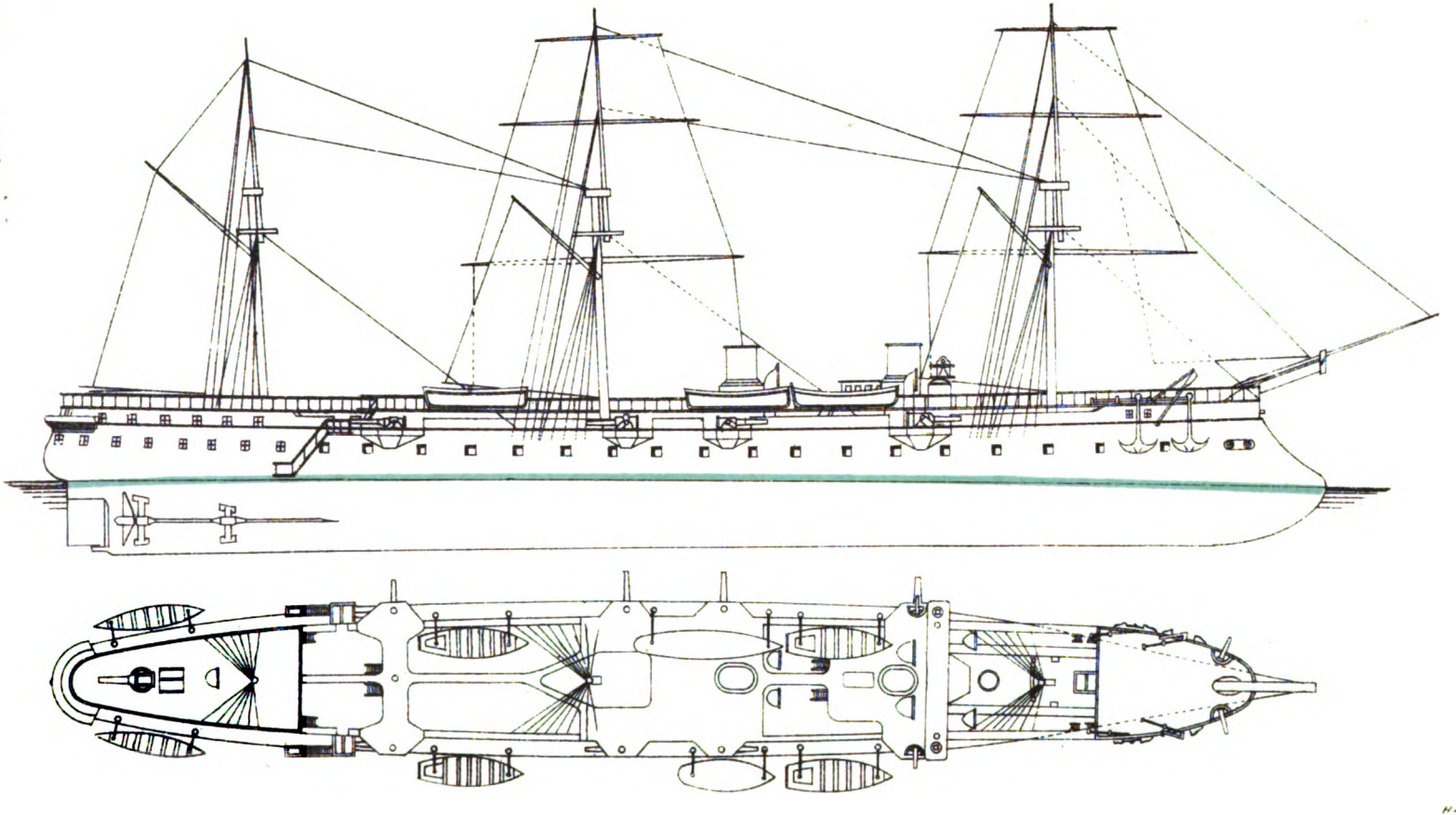
Protected Cruiser

"Isly" & "Jean-Bart".

Pl. 58.

FRENCH SHIPS.



HANHART LITH

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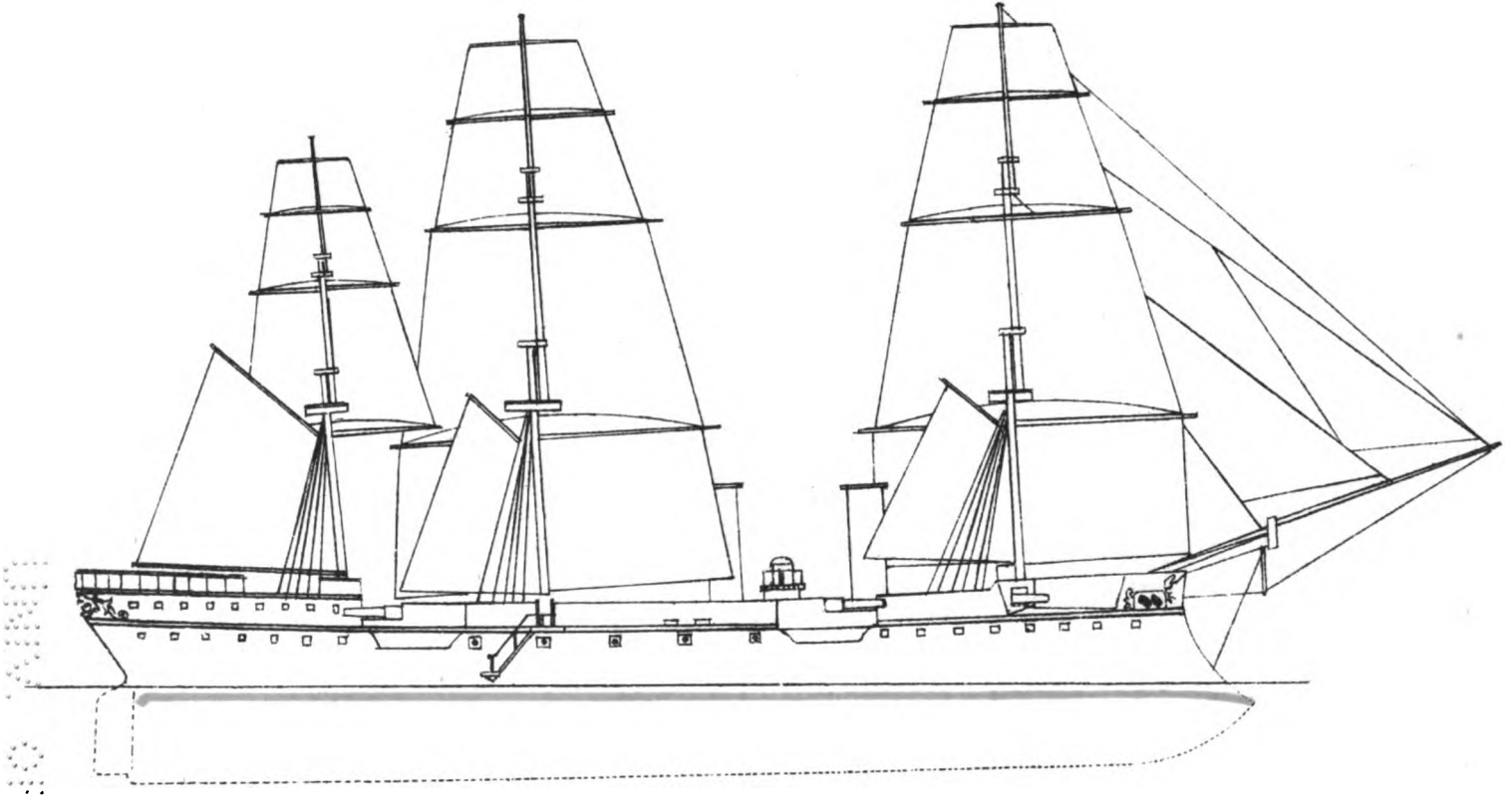
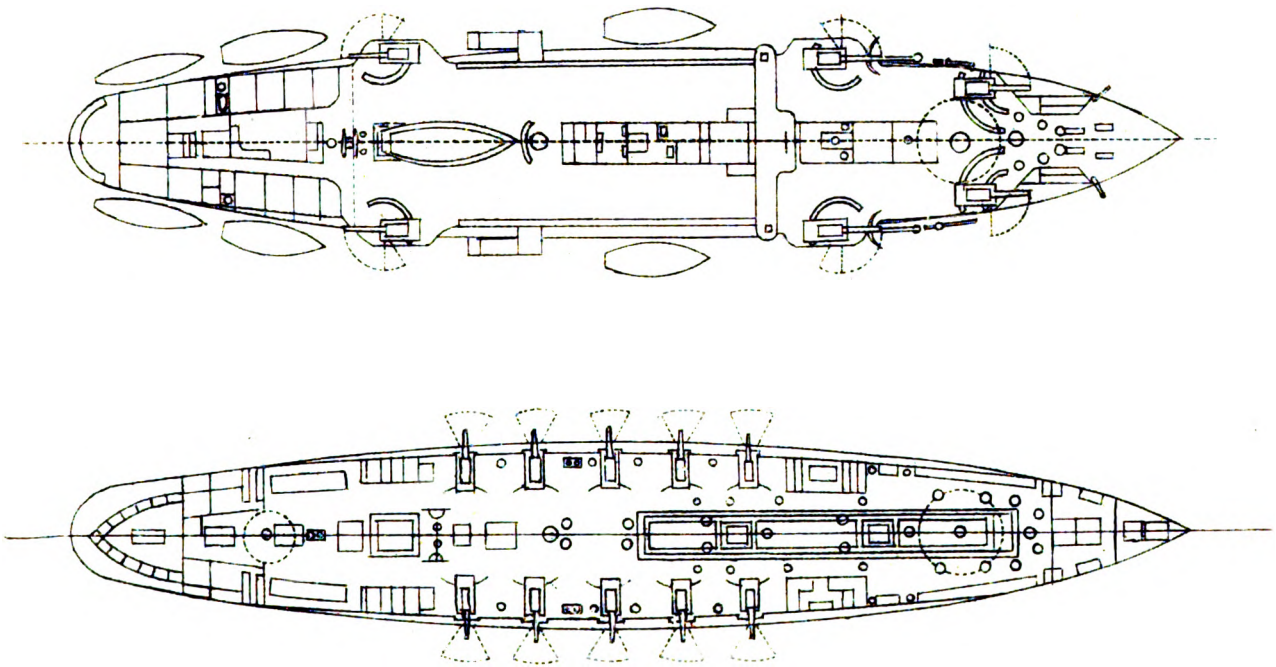
"Sfax" (Cruiser)



Digitized by Google

FRENCH SHIPS.

"Sfax" (Cruiser)



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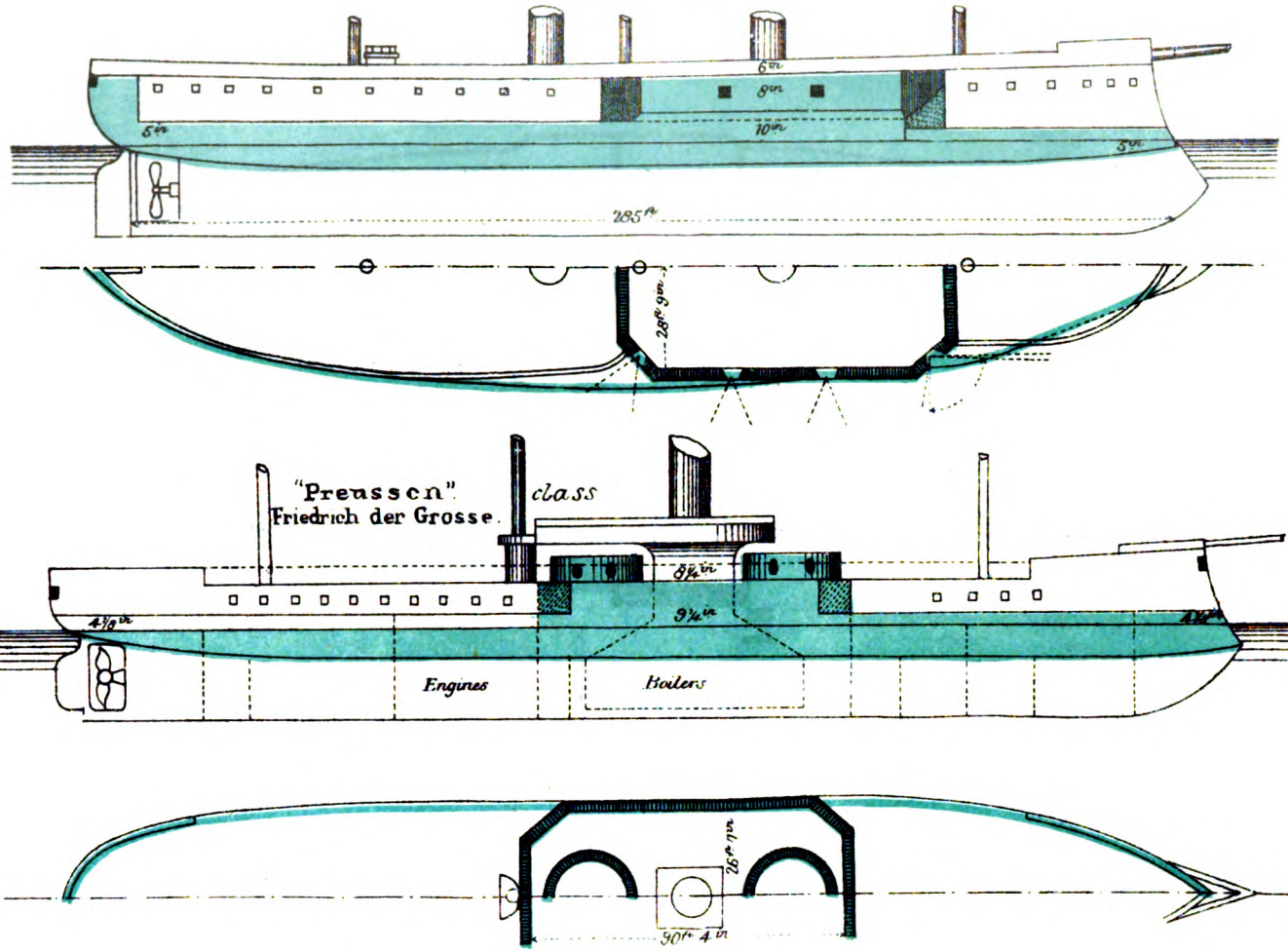
HANHART LITH

GERMAN SHIPS.

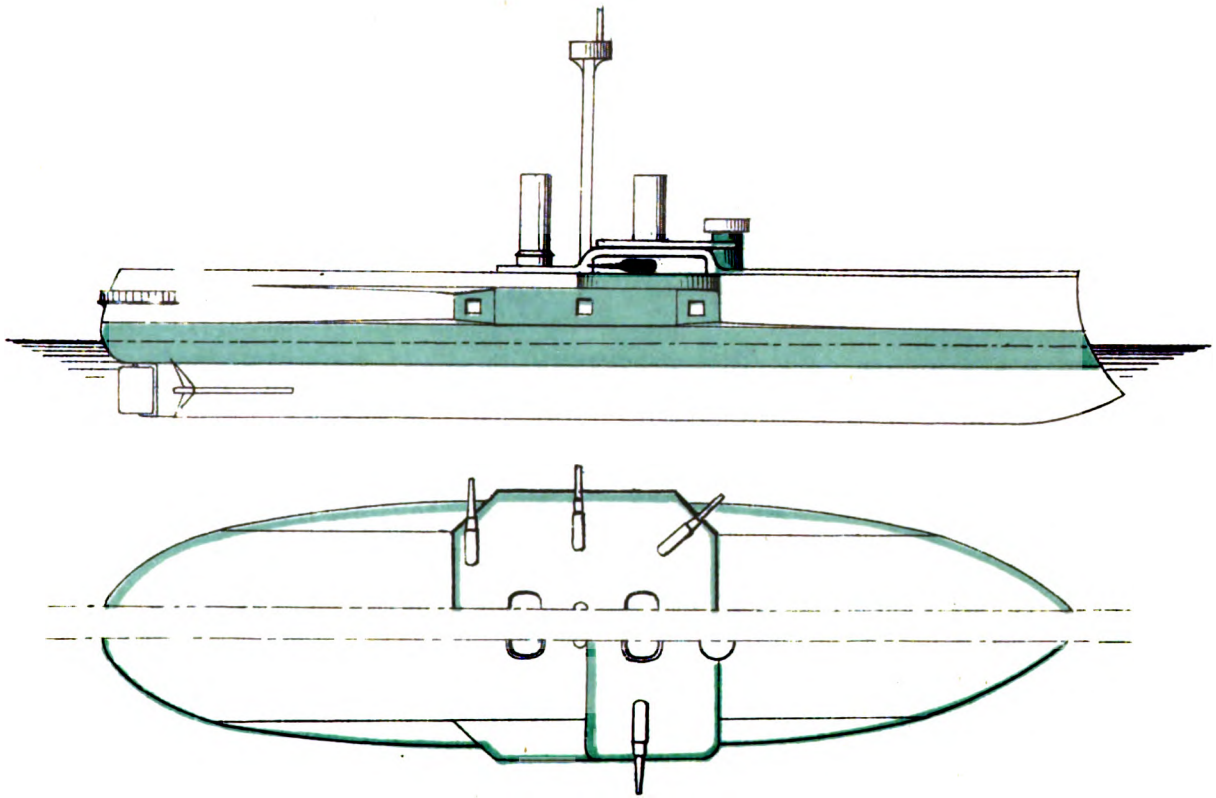
"Kaiser"
"Deutschland"

Pl. 61



Digitized by Google

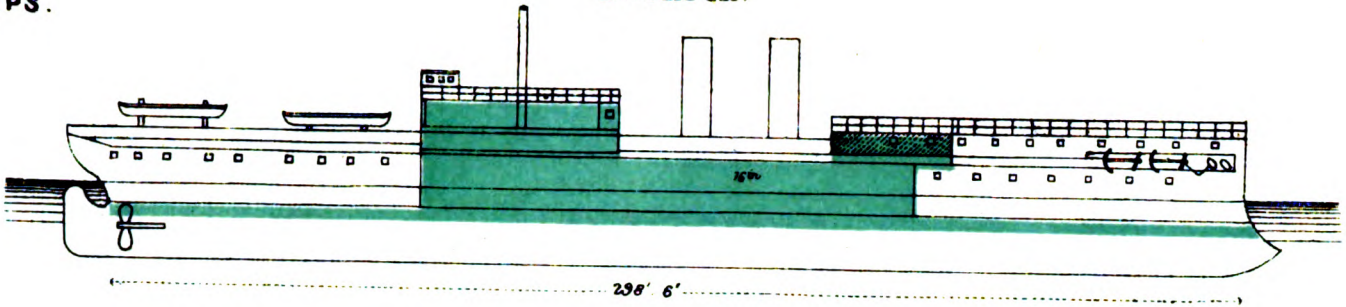
"Oldenburg"

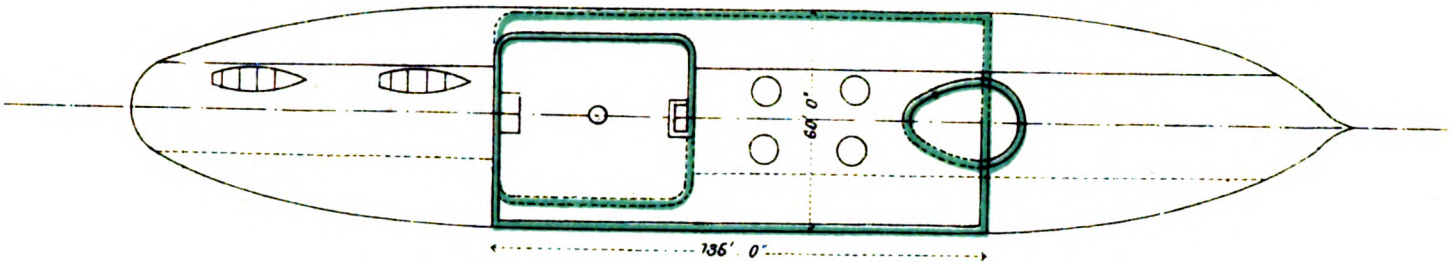


HANHART LITH.

Digitized by Google

"Sachsen"

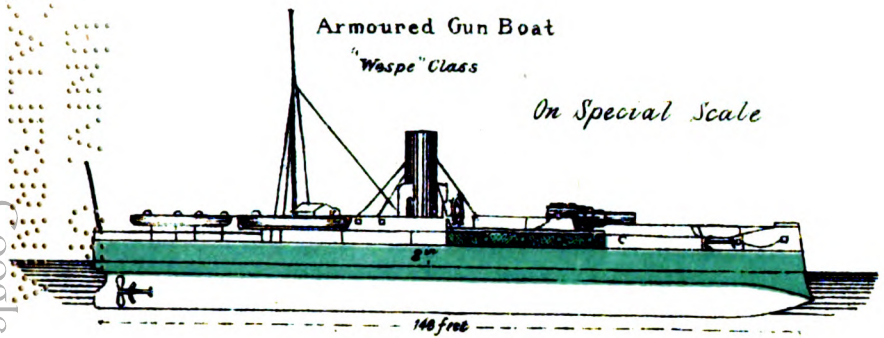


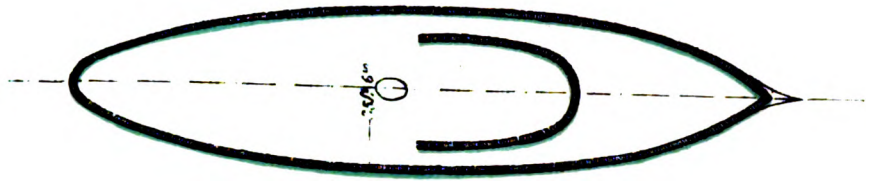


Armoured Gun Boat

"Wespe" Class

On Special Scale





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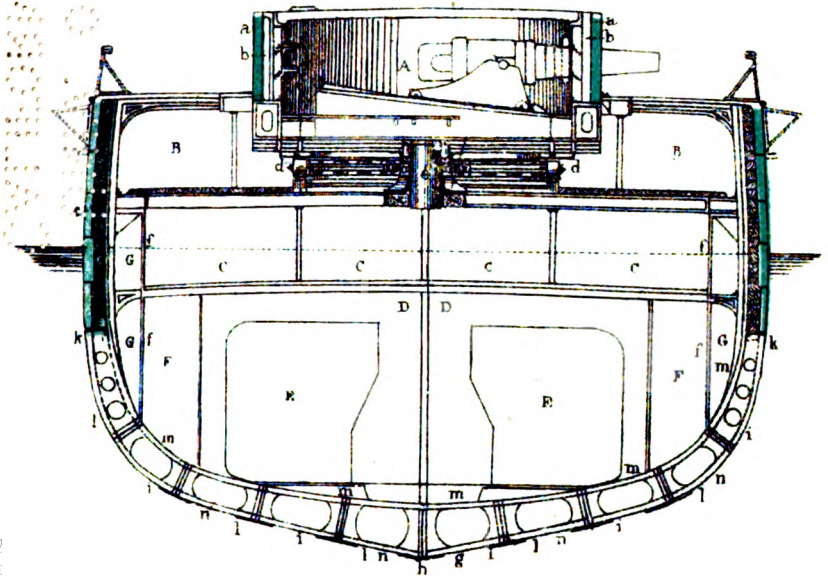
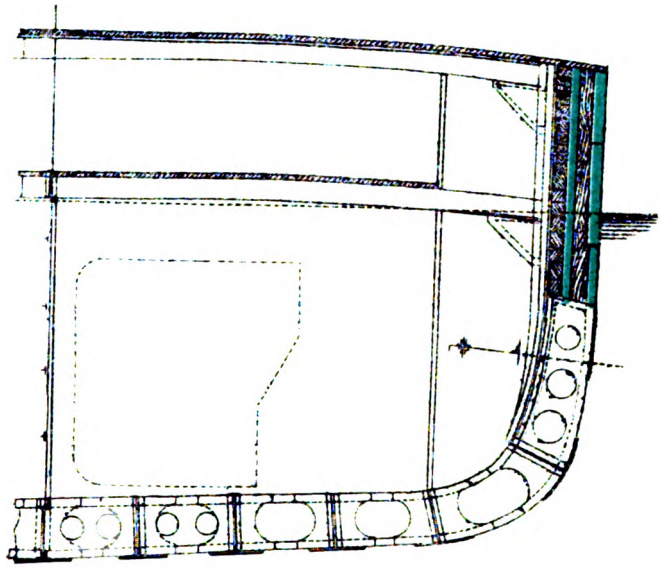
MANHART LITH

GERMAN SHIPS.

Section through turret



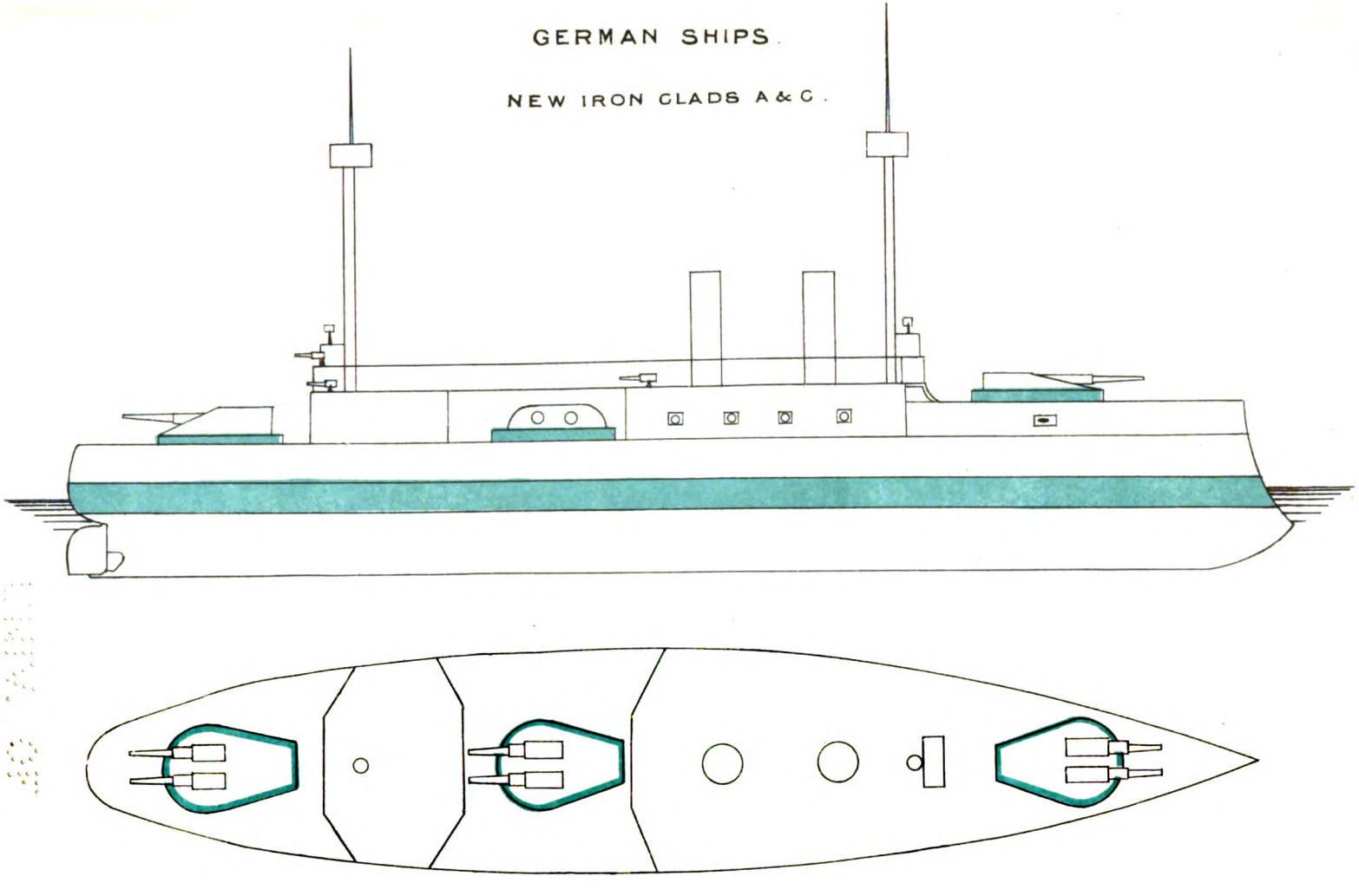
Half Midship Section "Sachsen"



Digitized by Google

GERMAN SHIPS.

NEW IRON CLADS A & C.



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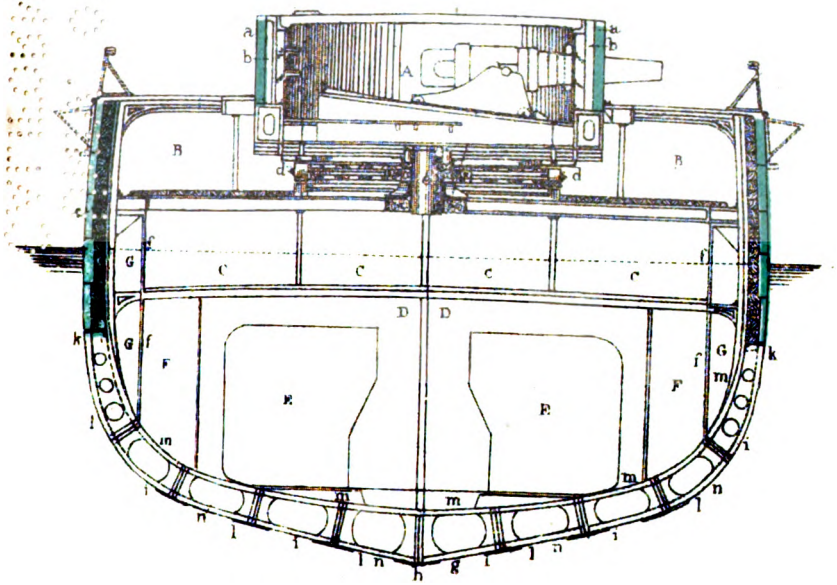
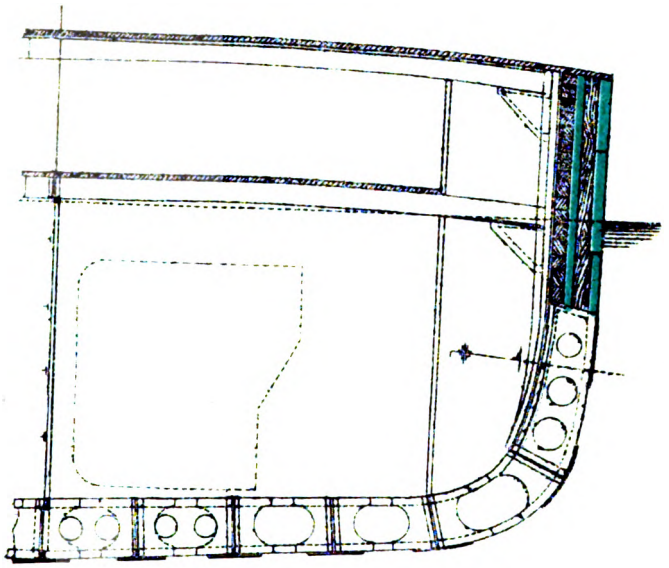
HANHART LITH

Section through turret



GERMAN SHIPS.

Half Midship Section "Sachsen"



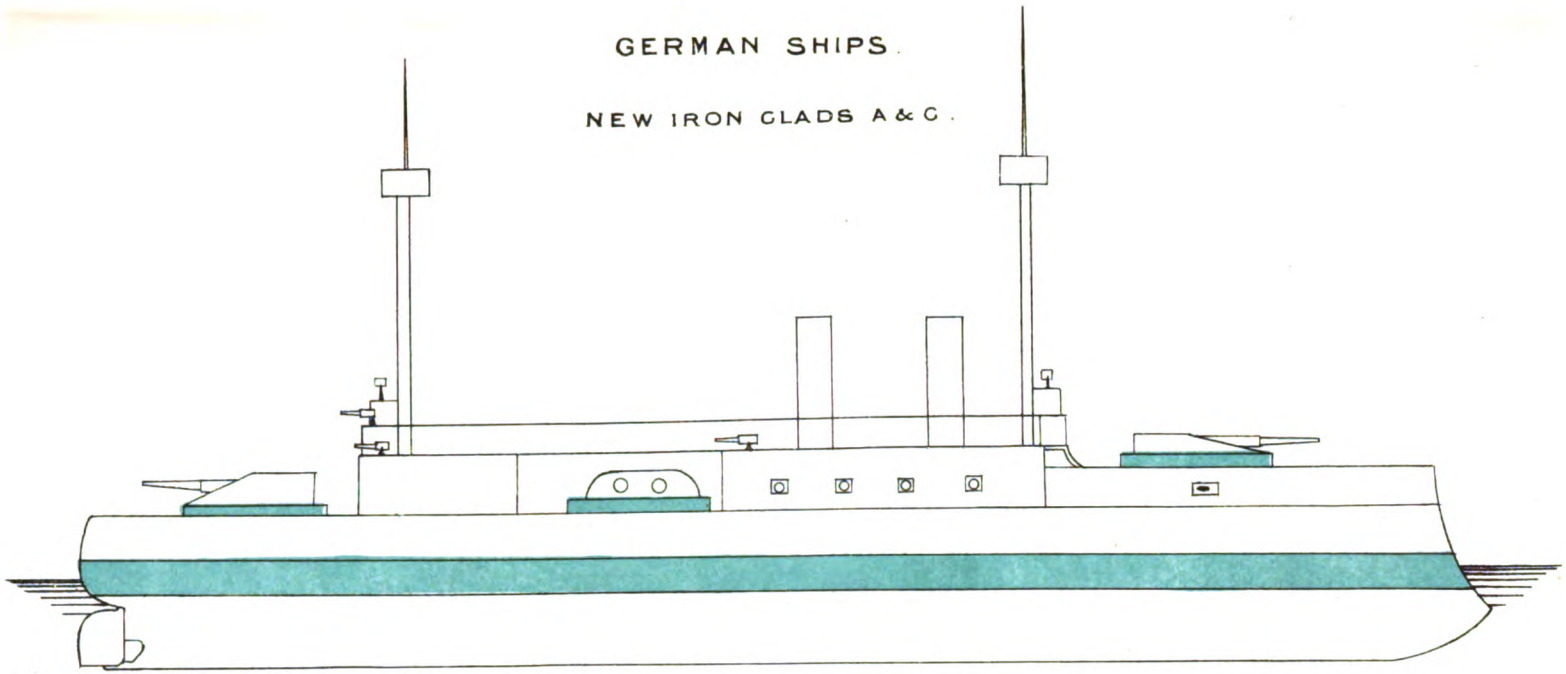
HANHART LITH.

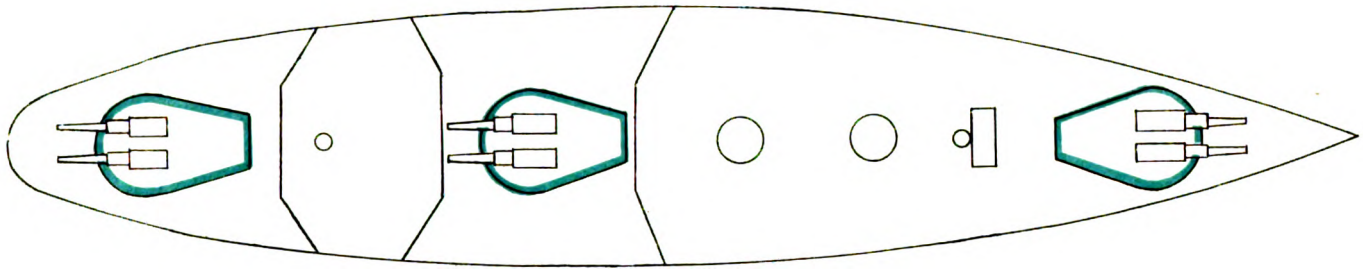
Digitized by Google

GERMAN SHIPS.

NEW IRON CLADS A & C.

Pl. 65.





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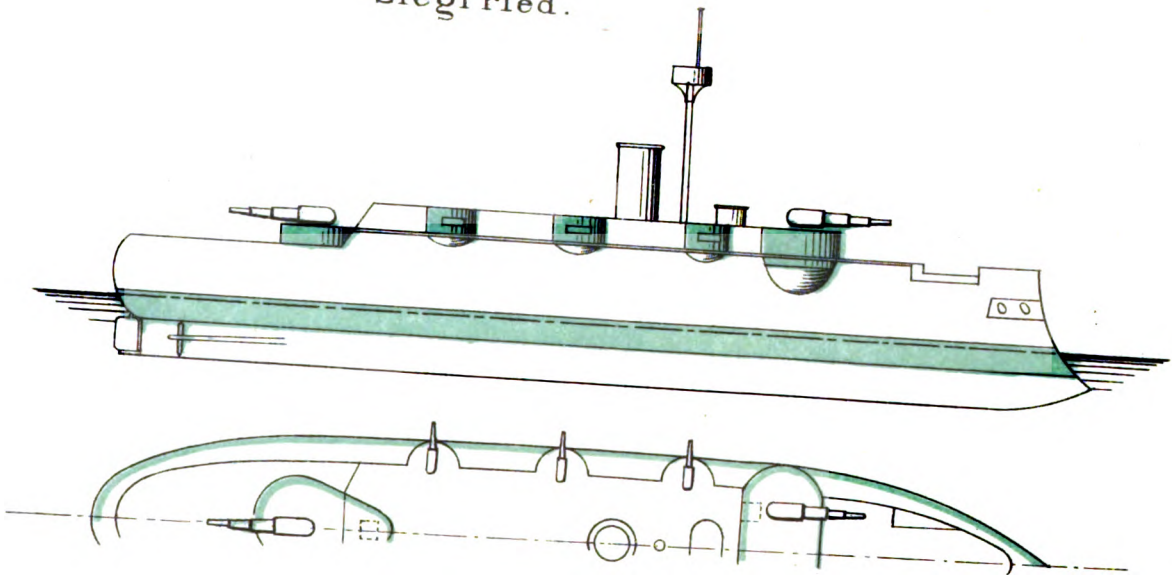
HANHART LITH

GERMAN SHIPS.

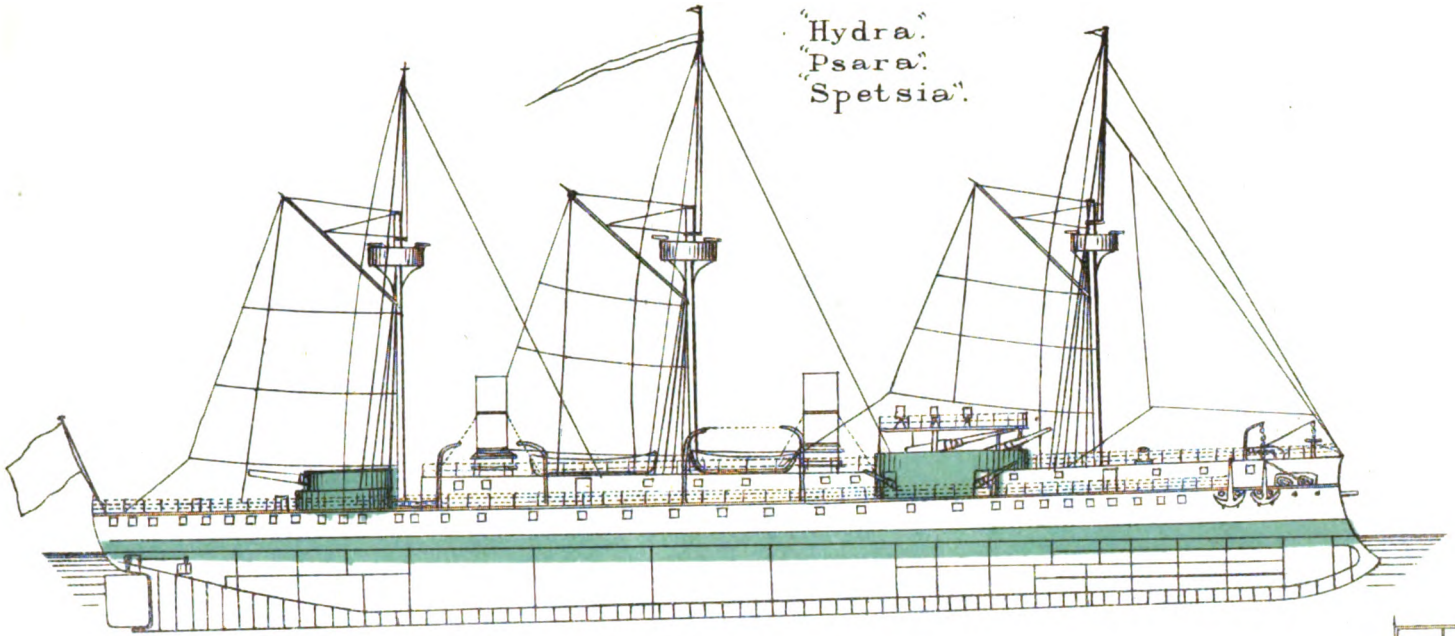
"Siegfried."

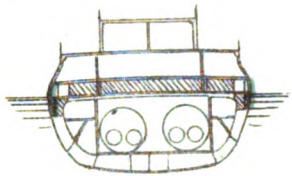


HANHART LITH.

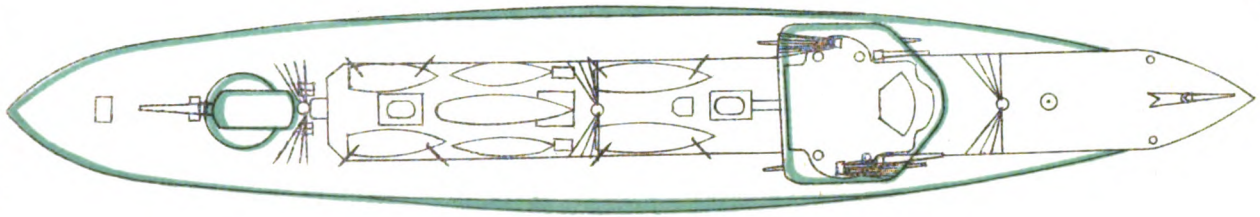
Digitized by Google

"Hydra".
"Psara".
"Spetsia".





Midship Section.



Upper Deck.

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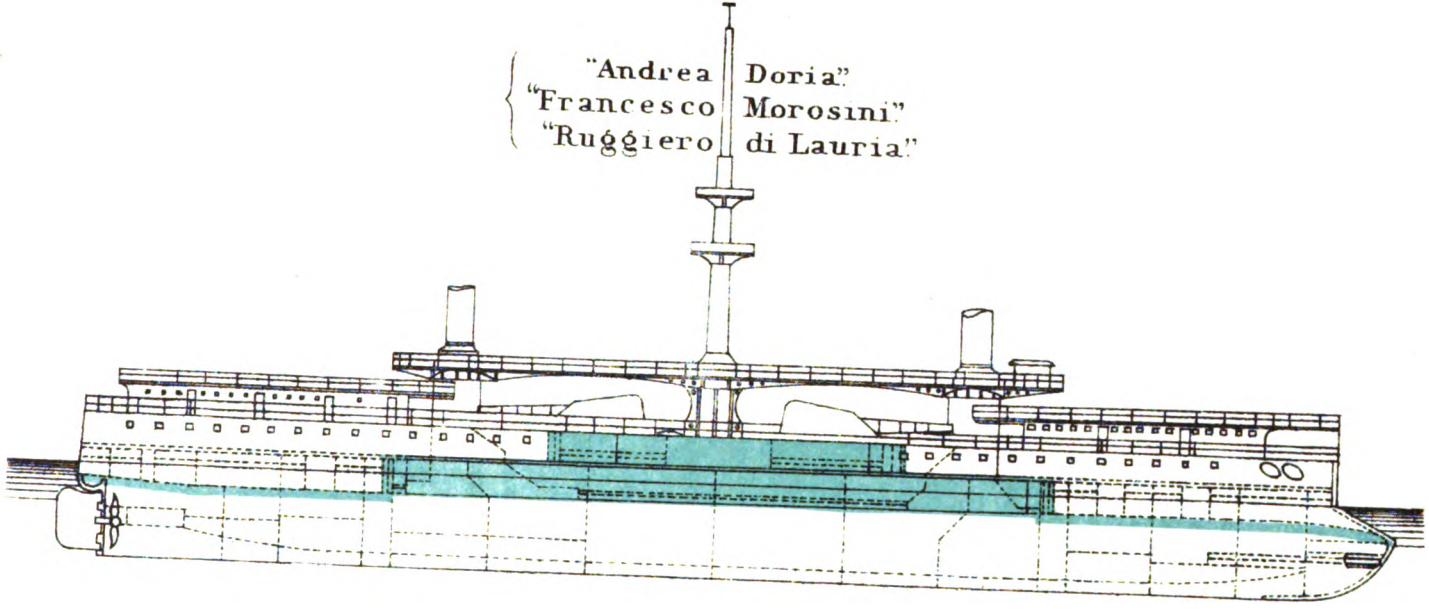
ITALIAN SHIPS.

"Andrea Doria"
"Francesco Morosini"
"Ruggiero di Lauria"



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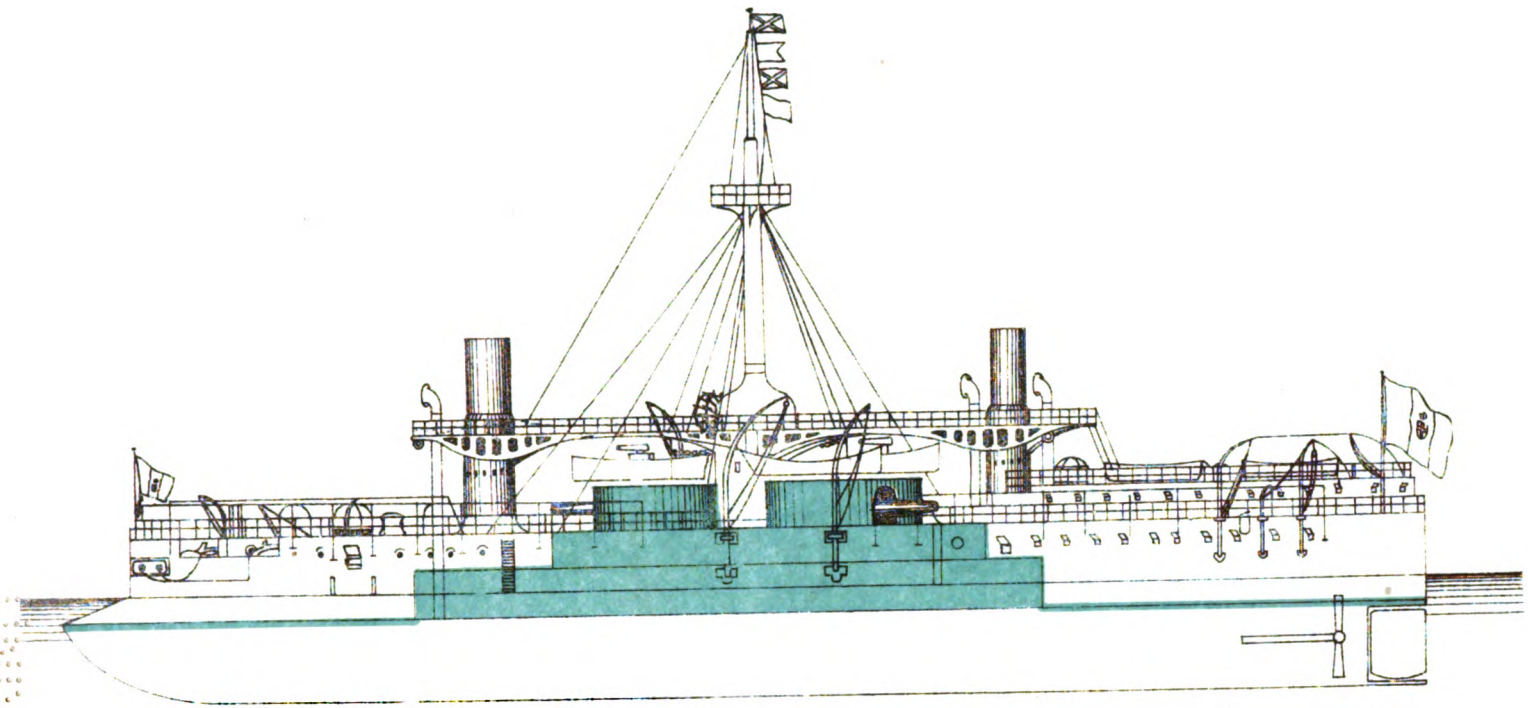
ITALIAN SHIPS.

"Duilio."
"Dandolo."



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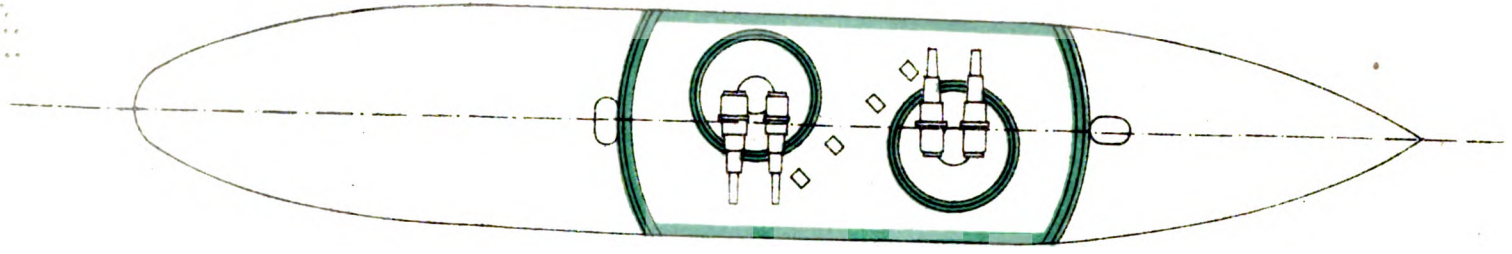
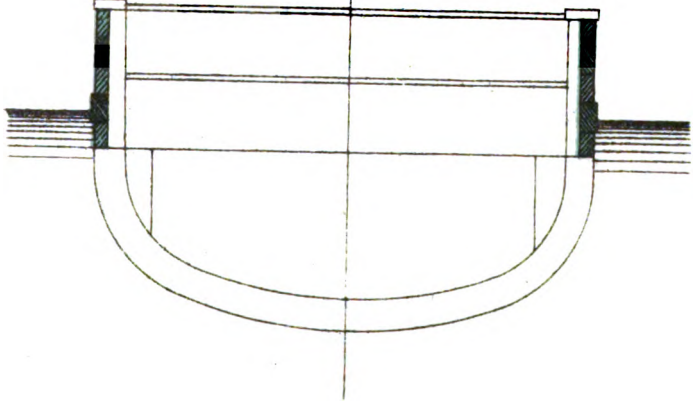
ITALIAN SHIPS.

"Duilio" & Dandolo".

Deck Plan.



Midship Section.

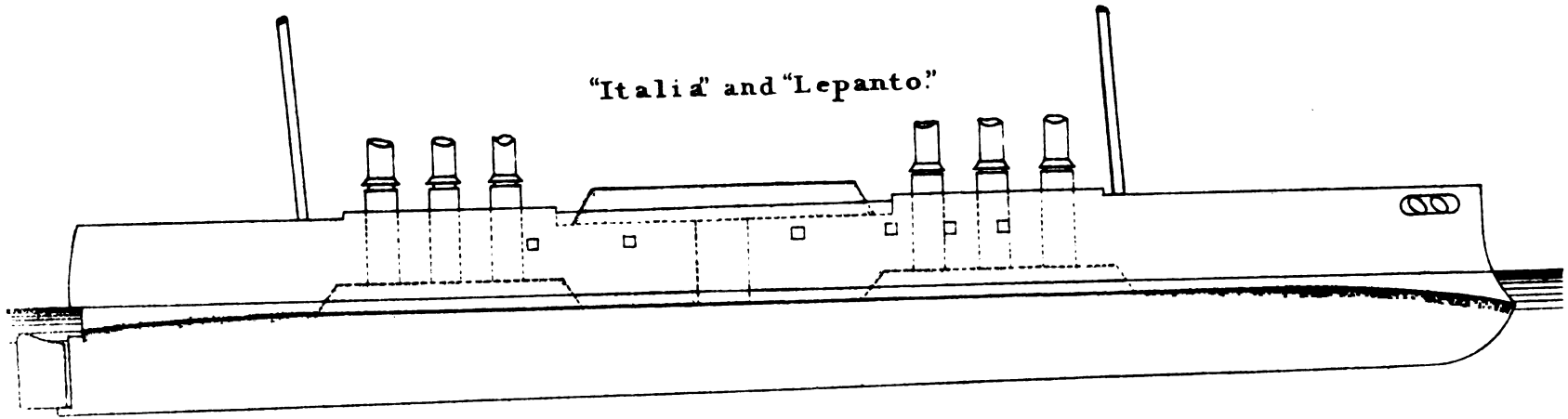


HANHART LITH.

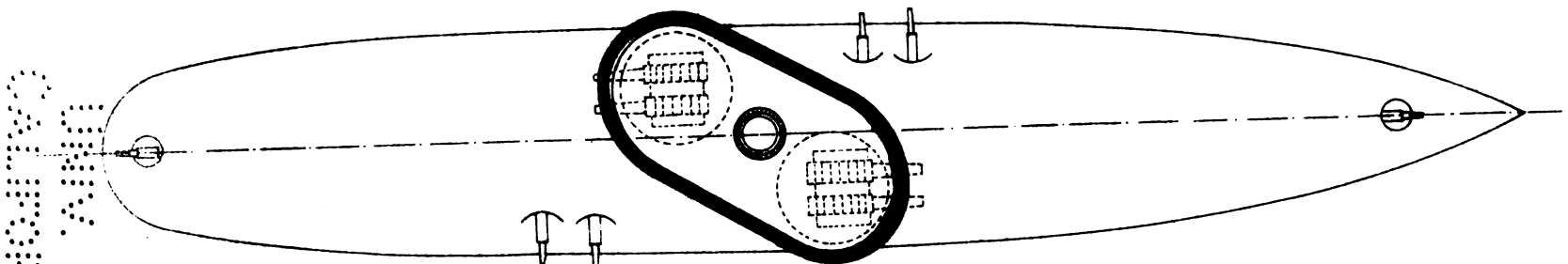
Digitized by Google

ITALIAN SHIPS.

"Italia" and "Lepanto."



Upper Deck.



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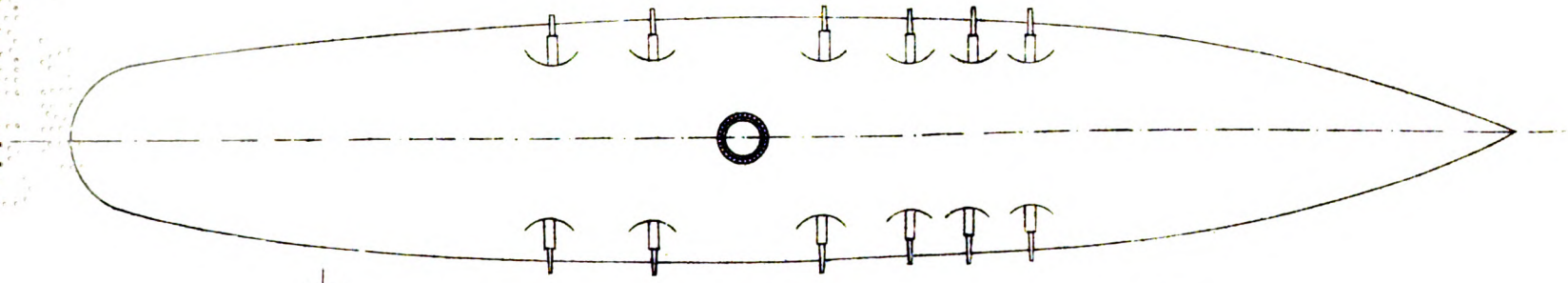
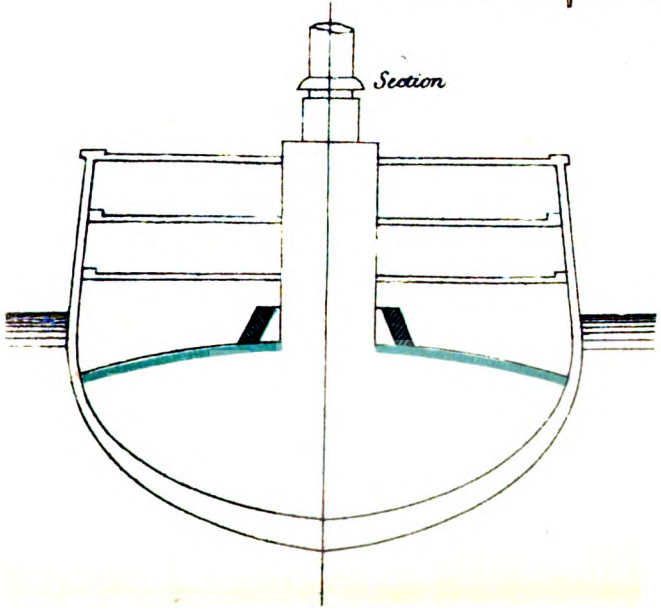
ITALIAN SHIPS.

"Italia."

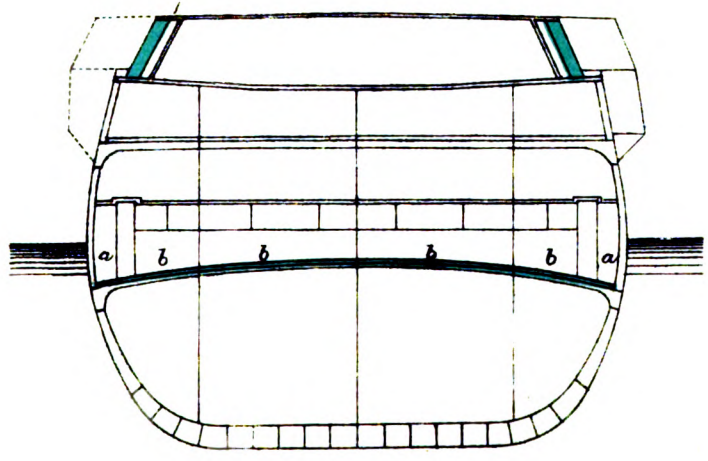
Main Deck.



Section.



Section.



HANHART LITH.

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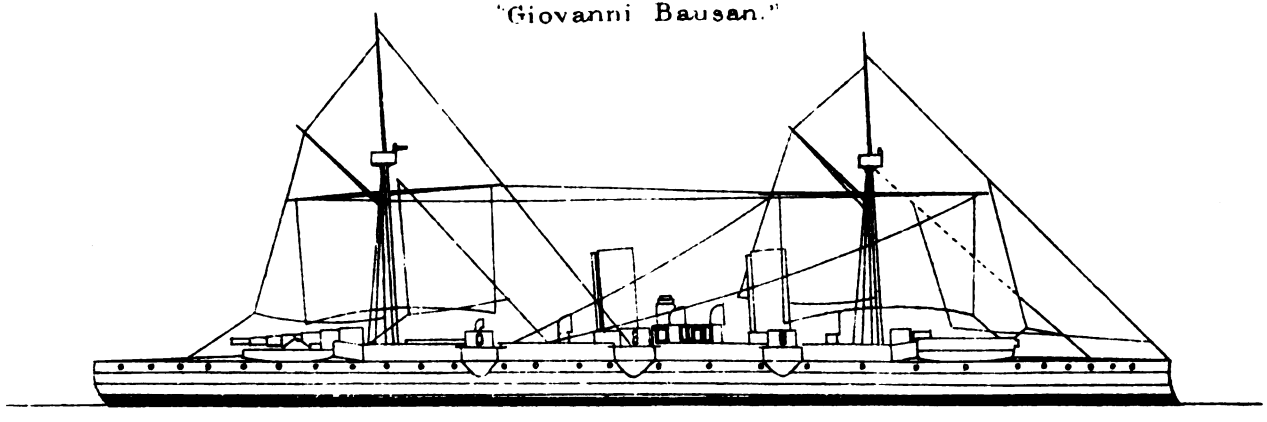
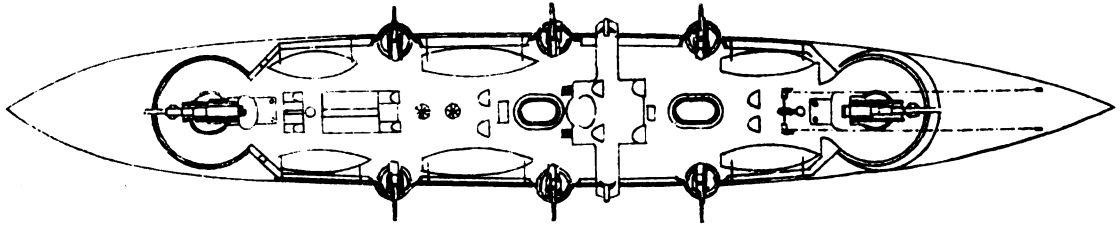
ITALIAN SHIPS.

"Giovanni Bausan."





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HANHART LITH.

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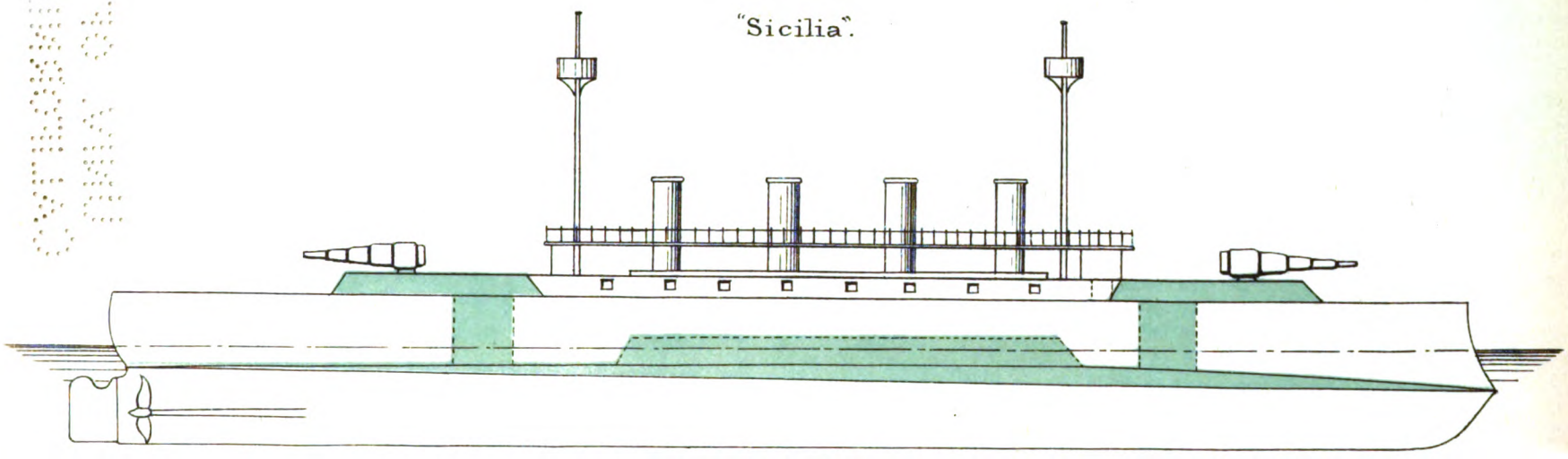

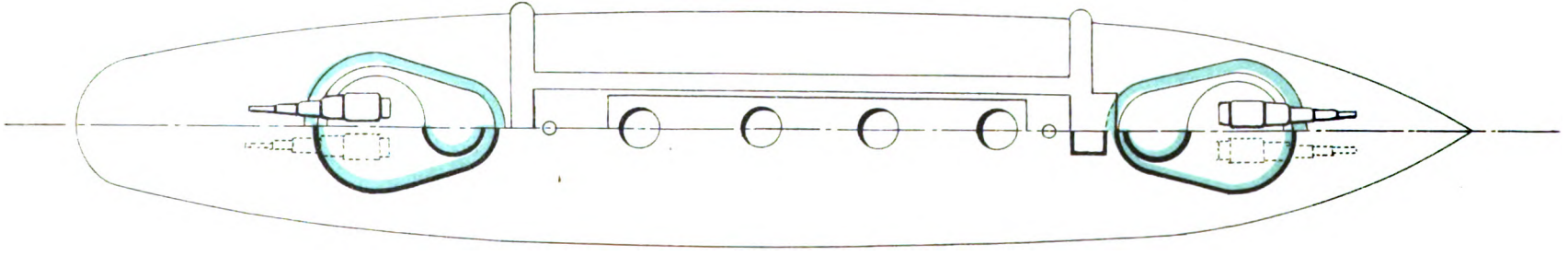

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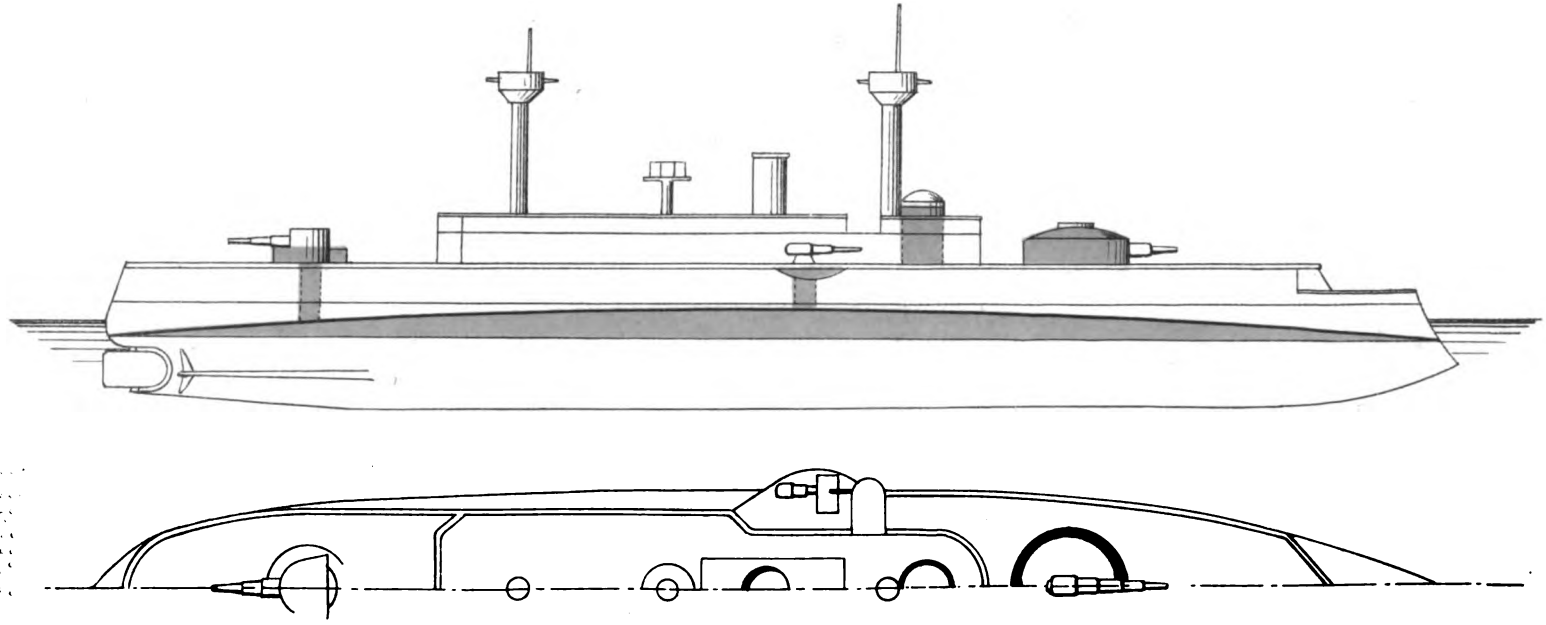
NETHERLAND SHIPS.

"Princess Wilhelmina".



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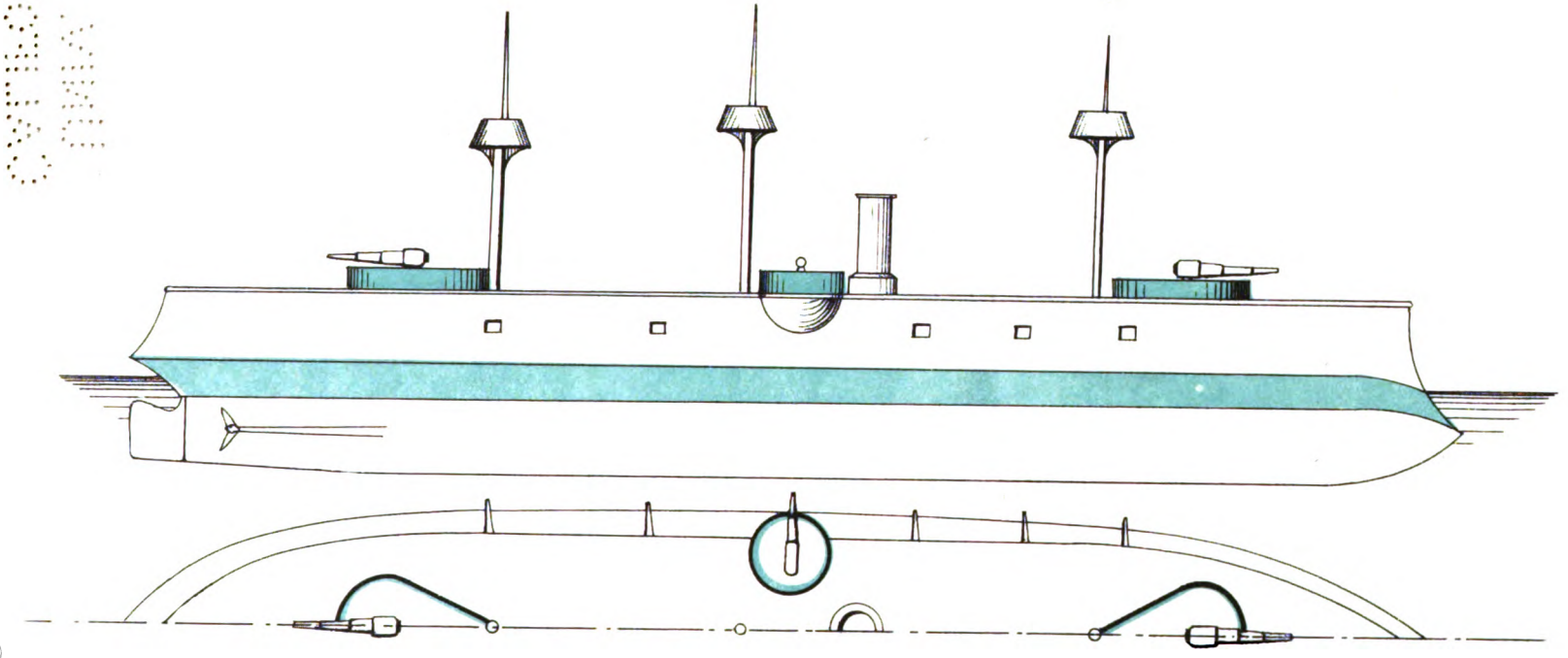

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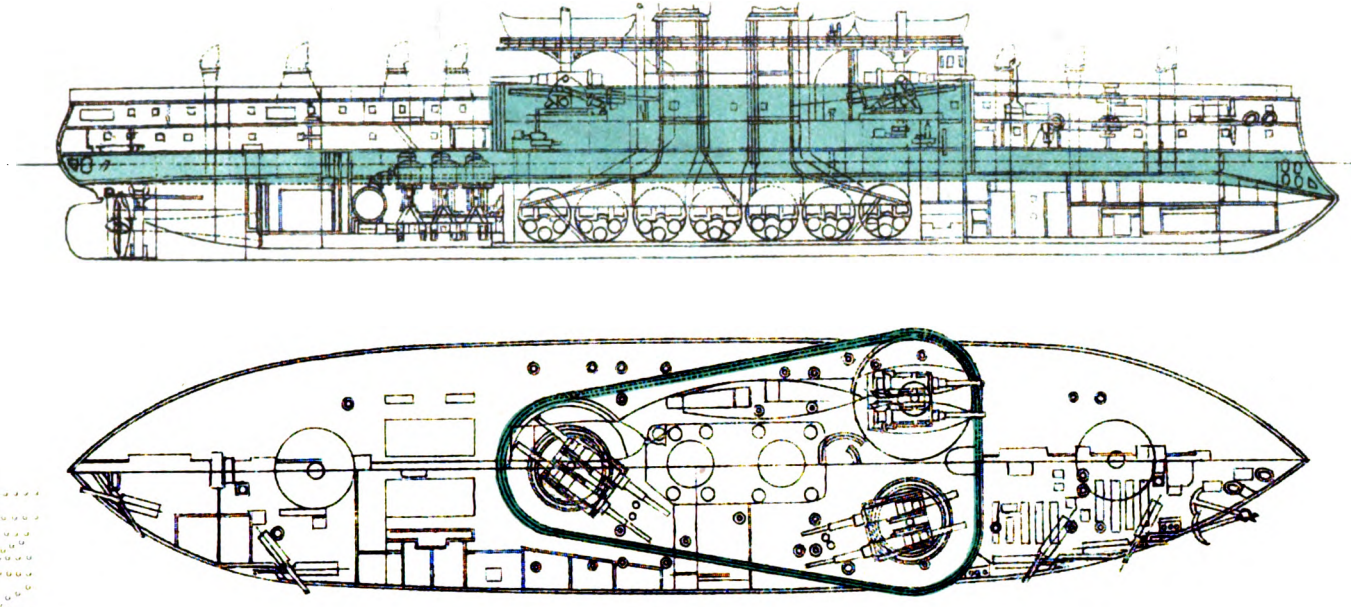
RUSSIAN SHIPS



"Catherine II"
"Tchesme"
"Sinope"

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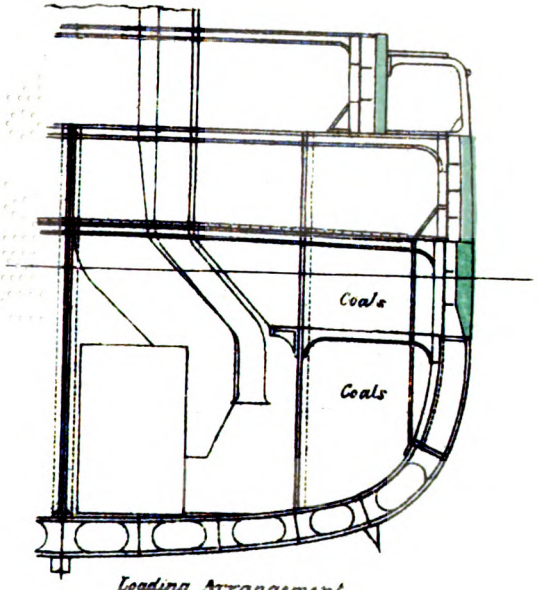
"Tchesme"
"Sinope"
"Catherine II."

RUSSIAN SHIPS.



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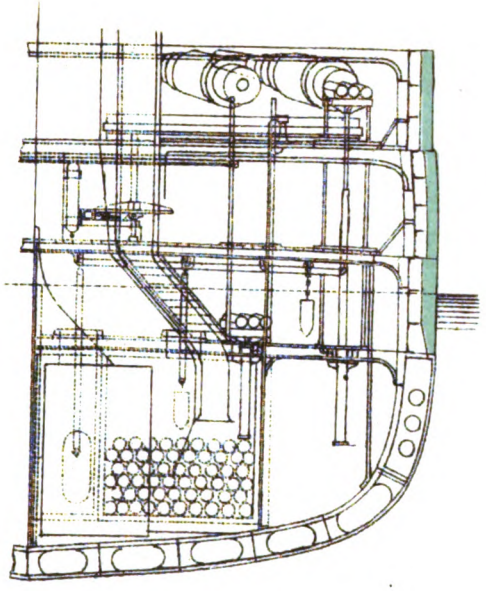

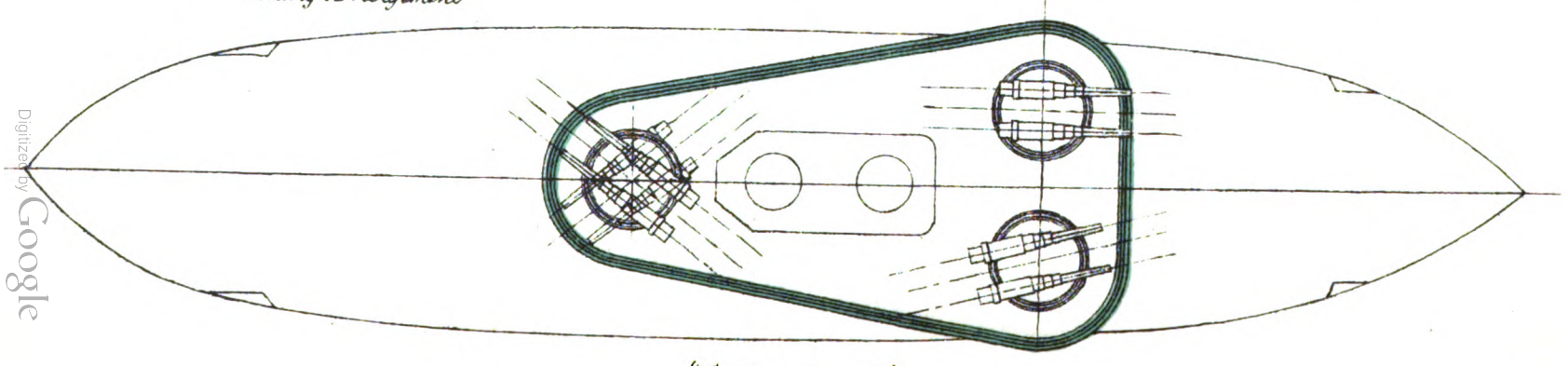

"Catherine II."

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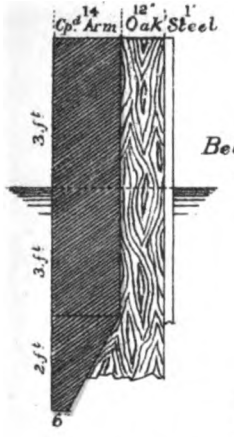

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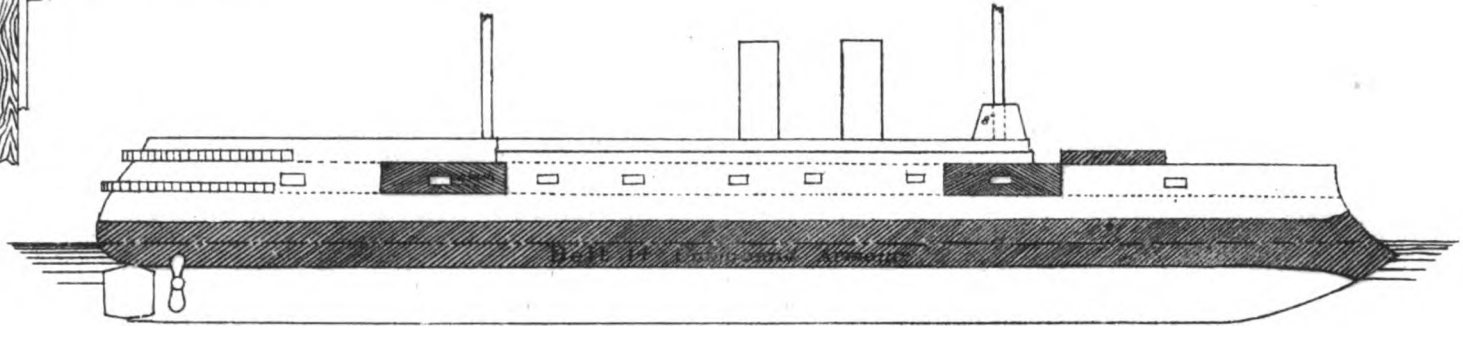

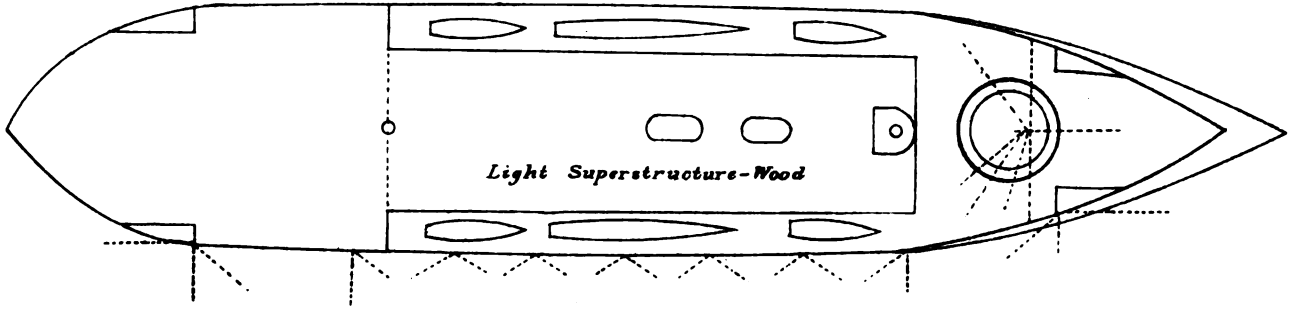

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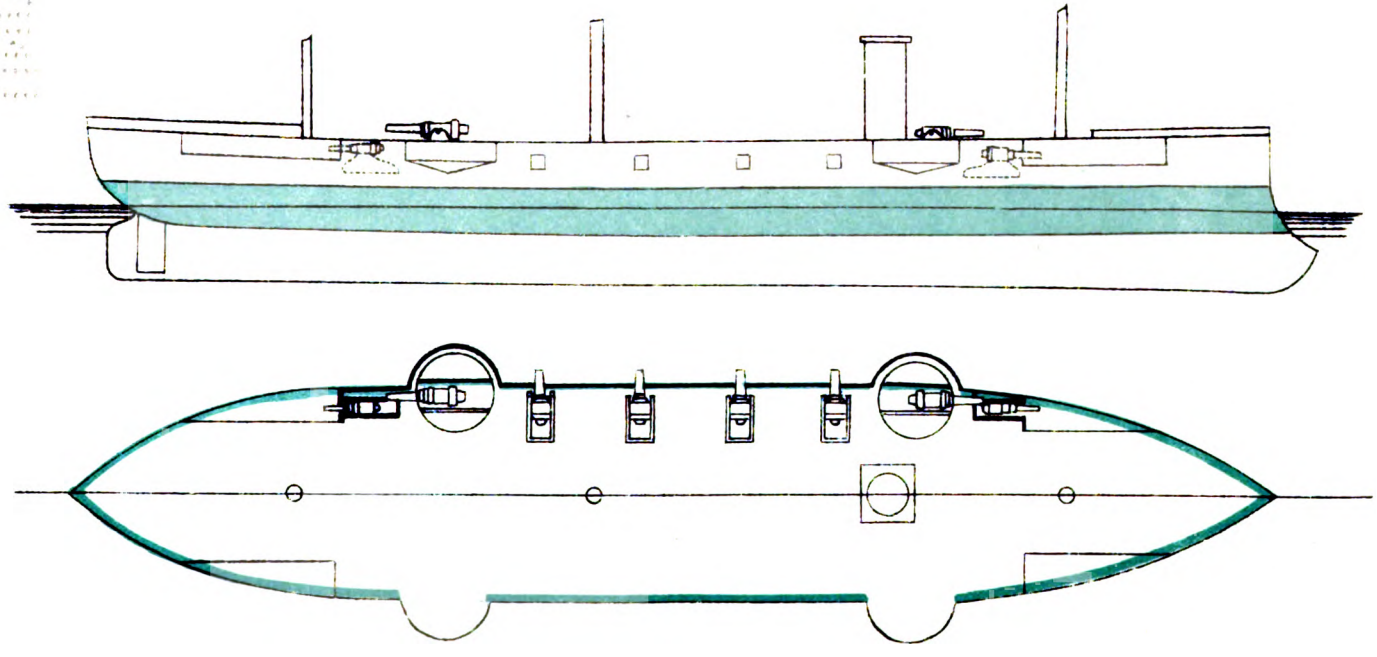
RUSSIAN SHIPS

"Minin"



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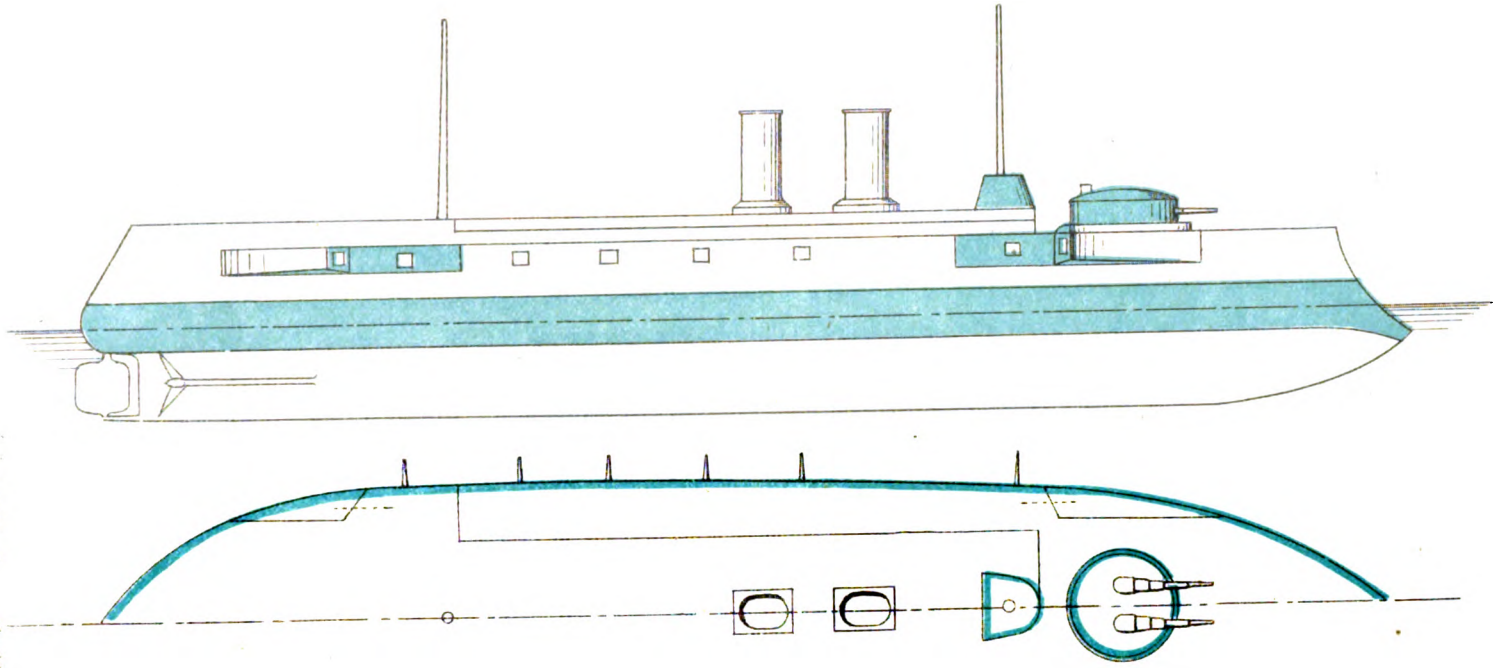
"Nicolai I."



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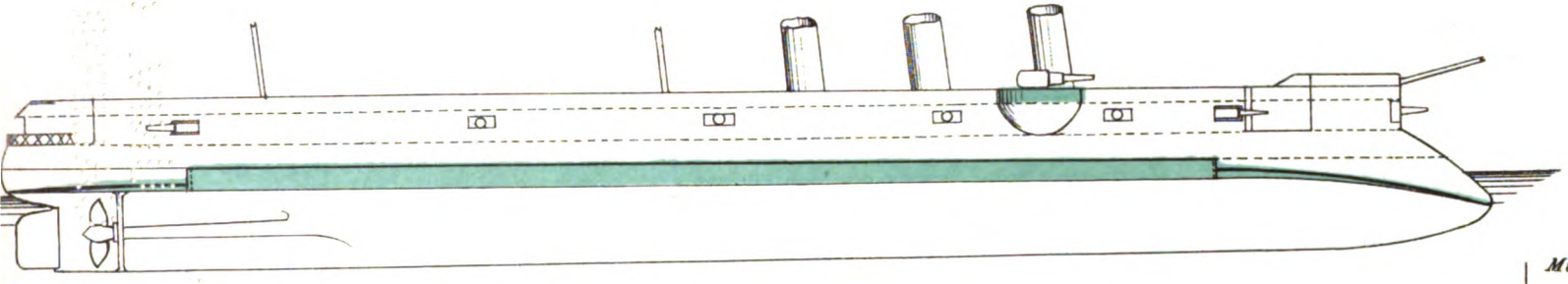

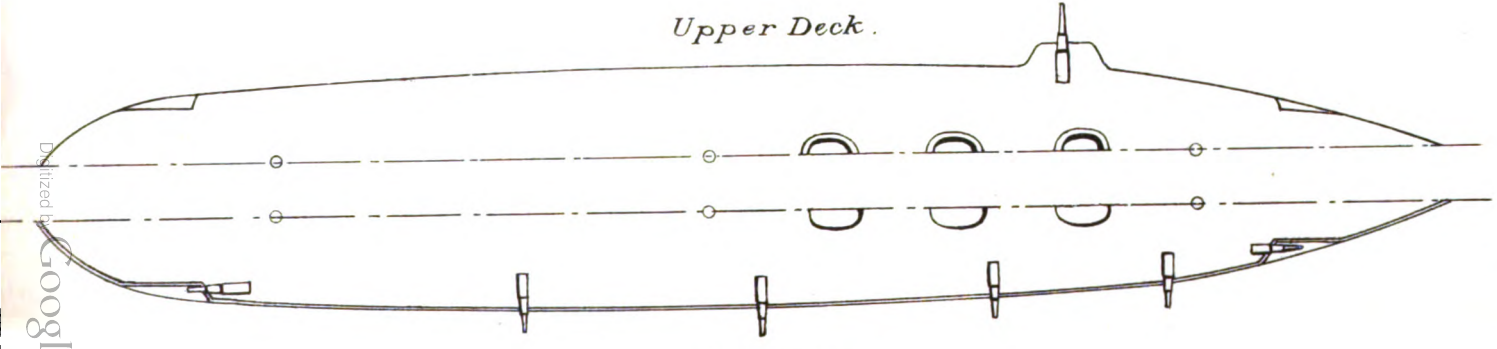

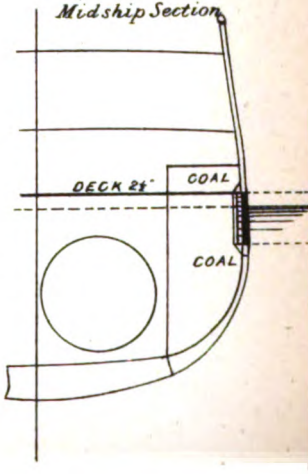

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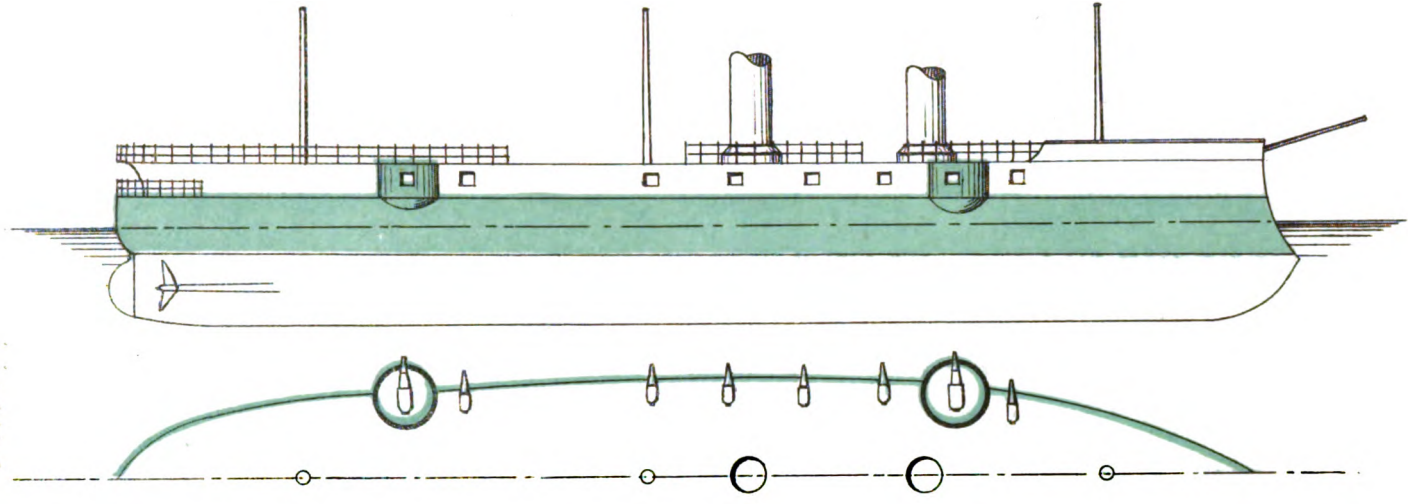
RUSSIAN SHIPS.

"Vladimir Monomach".



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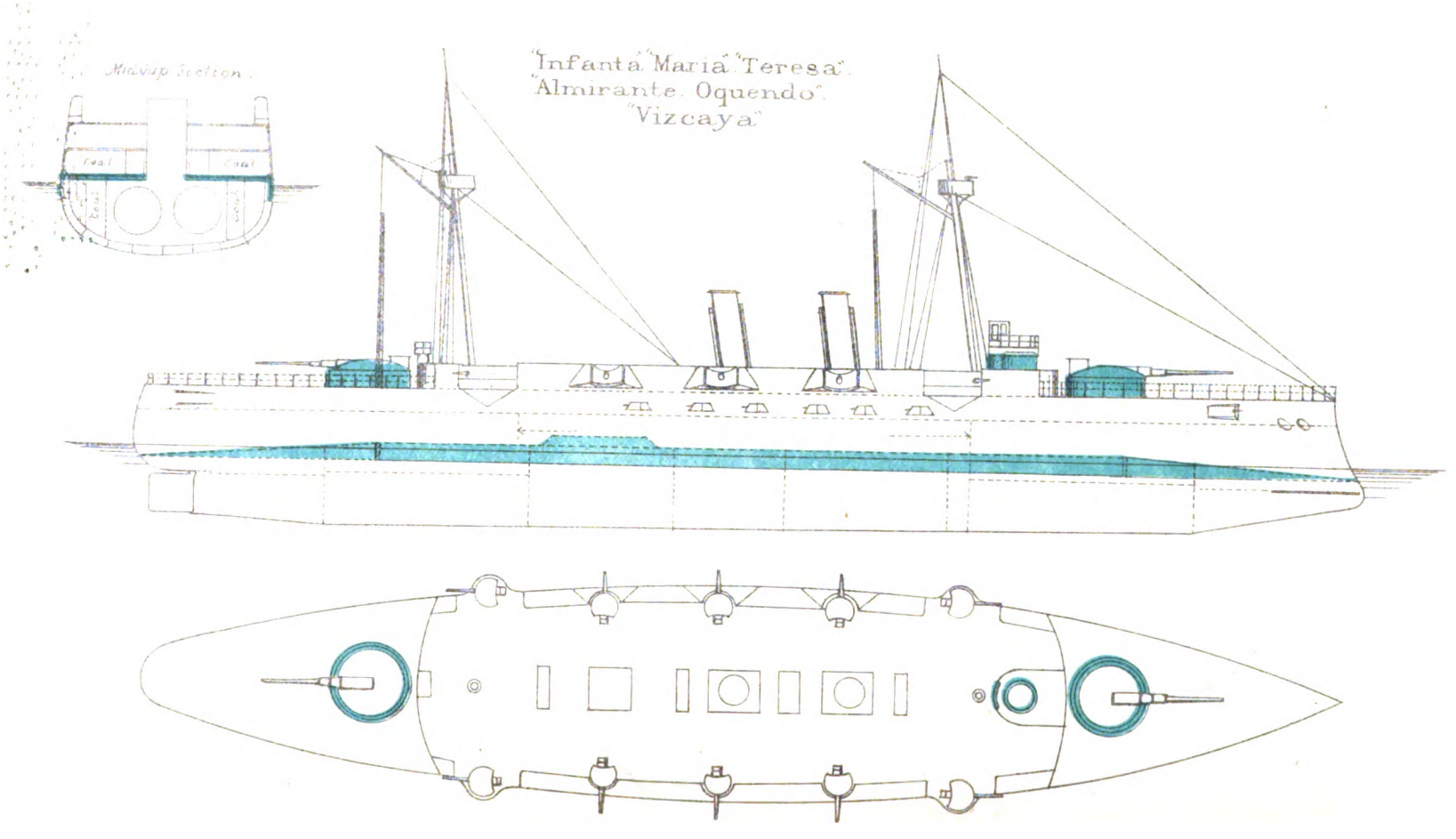
SPANISH SHIPS.



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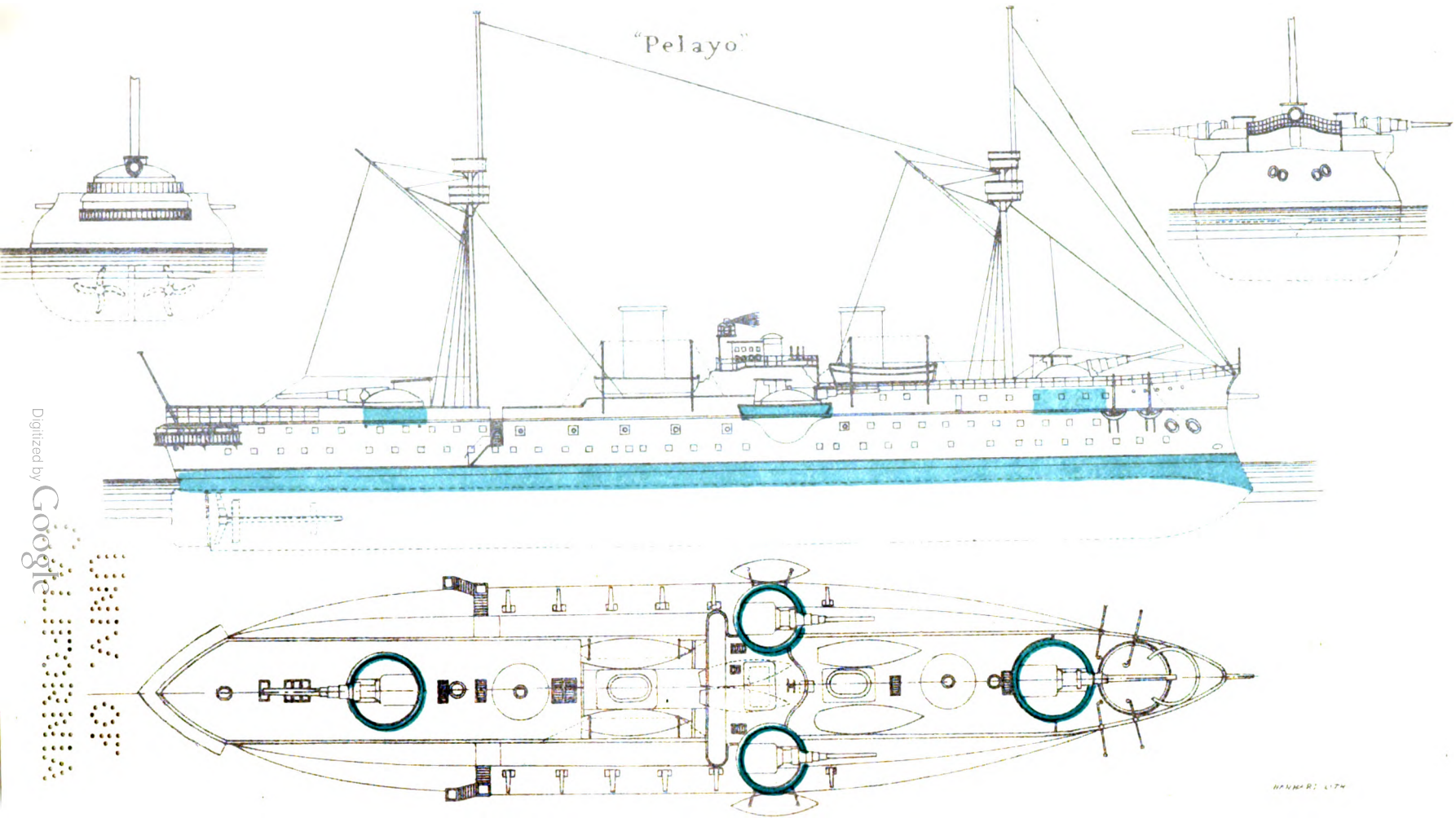

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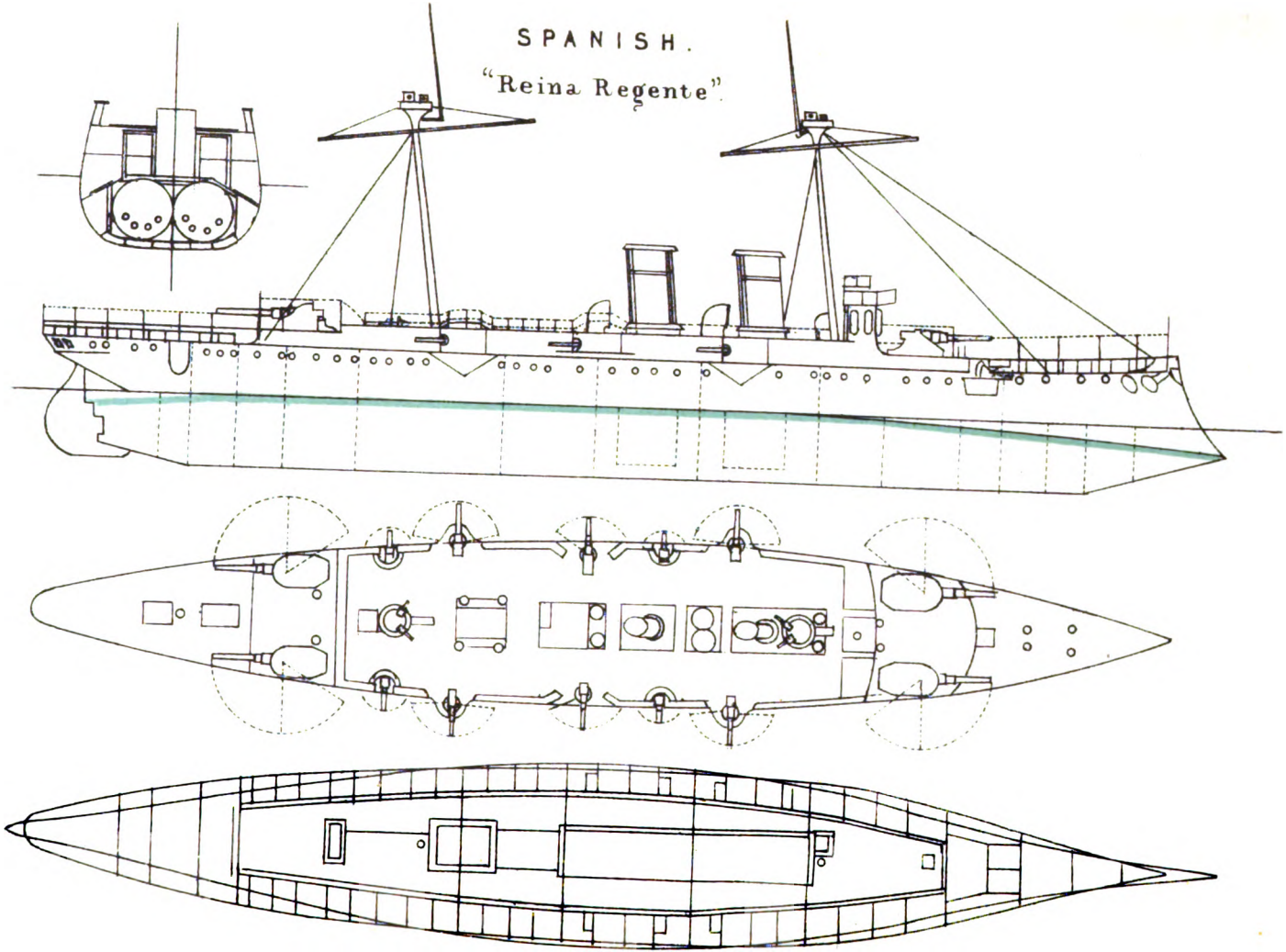
SPANISH.

"Reina Regente".



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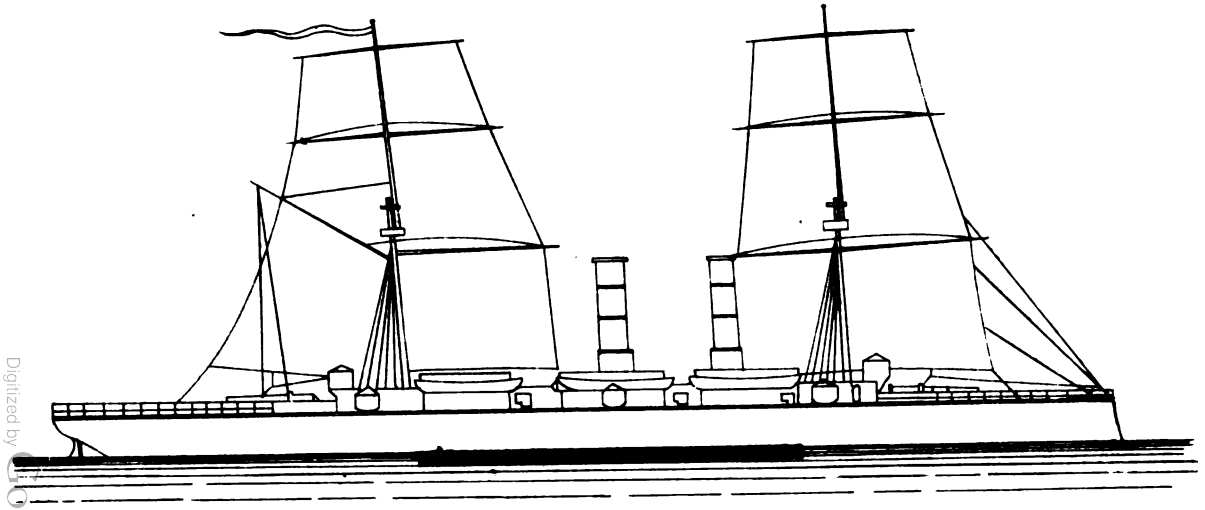
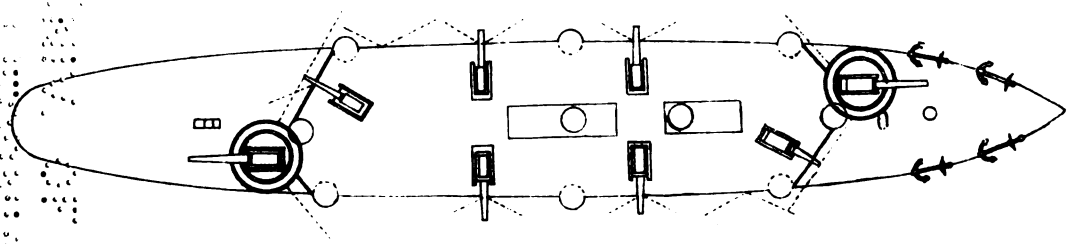
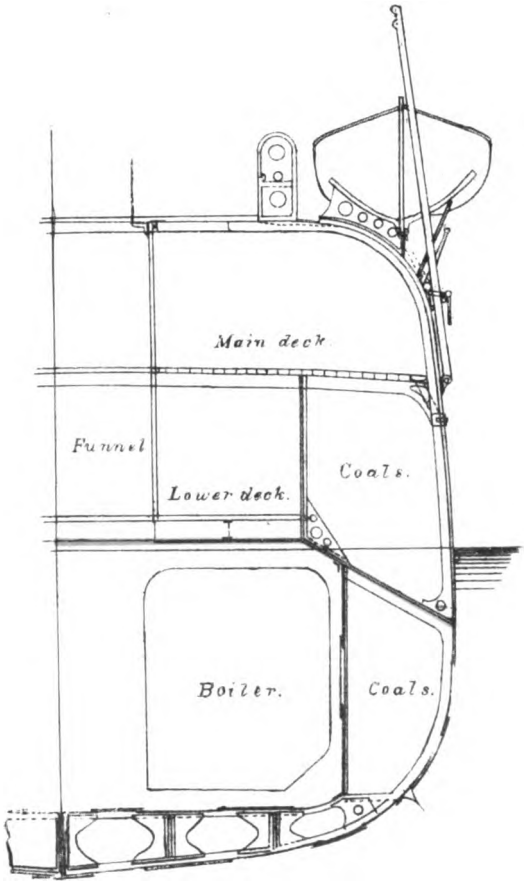
AMERICA—UNITED STATES SHIPS.

"Atlanta" & "Boston."







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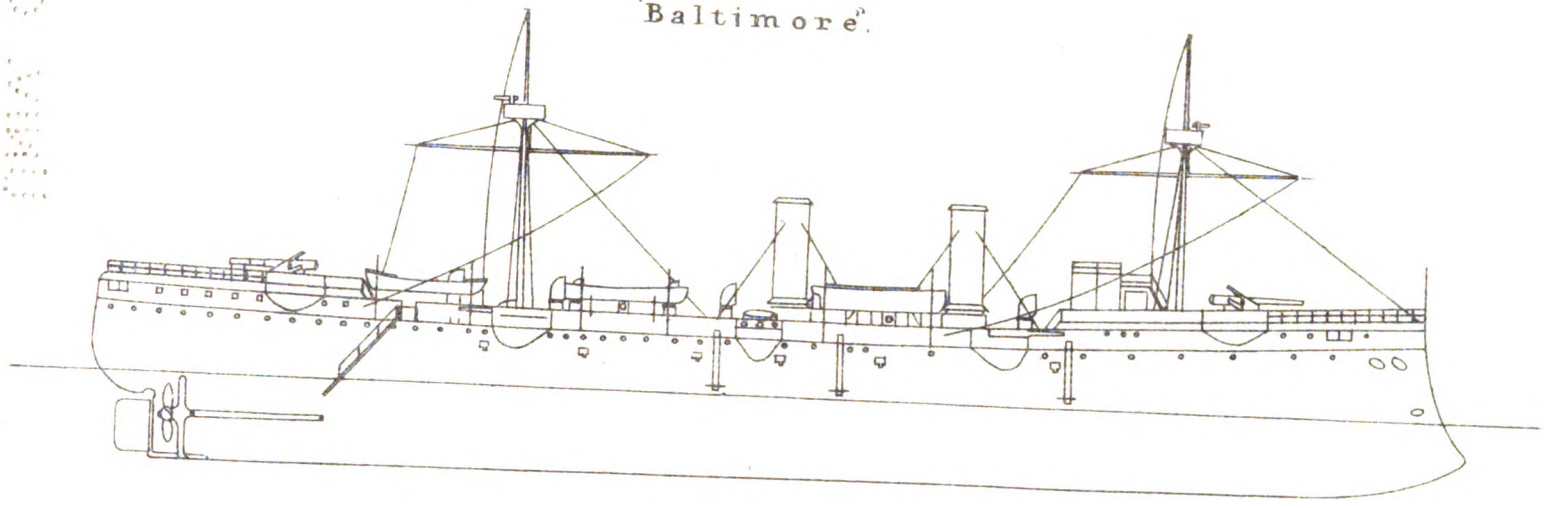
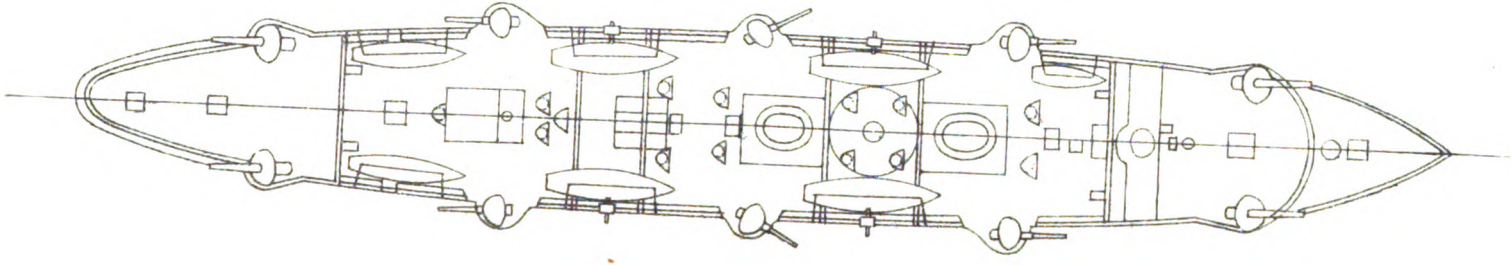
AMERICA—UNITED STATES SHIPS.

"Baltimore".





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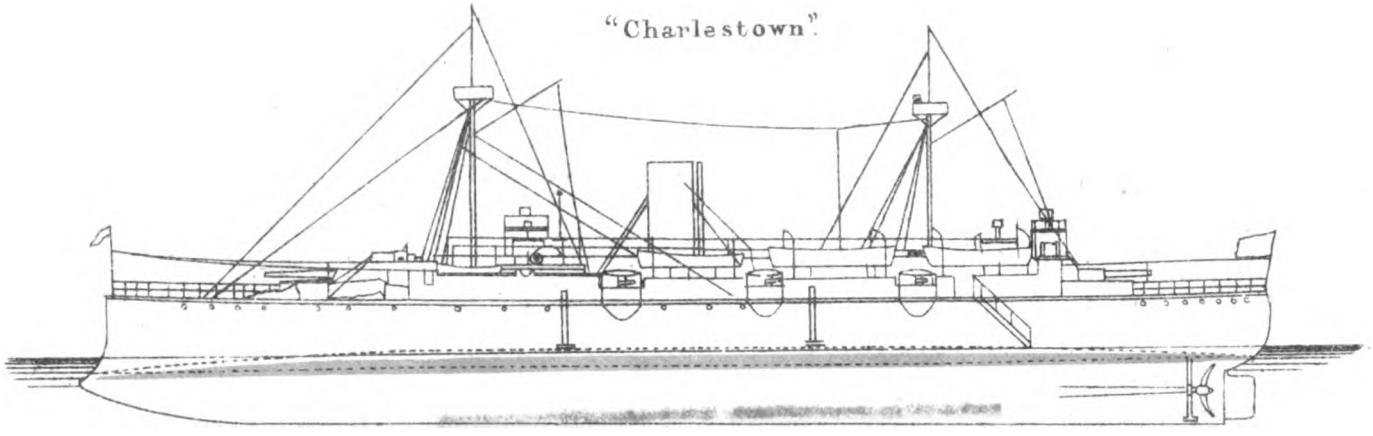
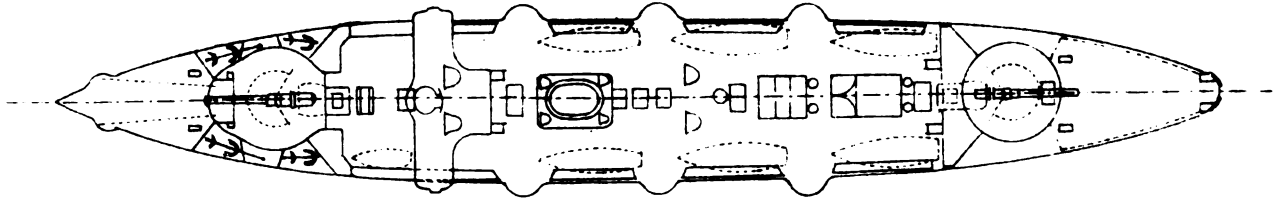
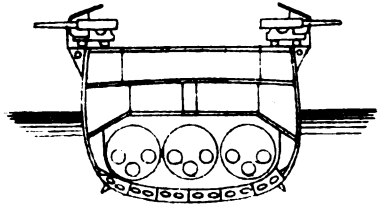
AMERICAN-UNITED STATES-SHIPS.

"Charlestown".







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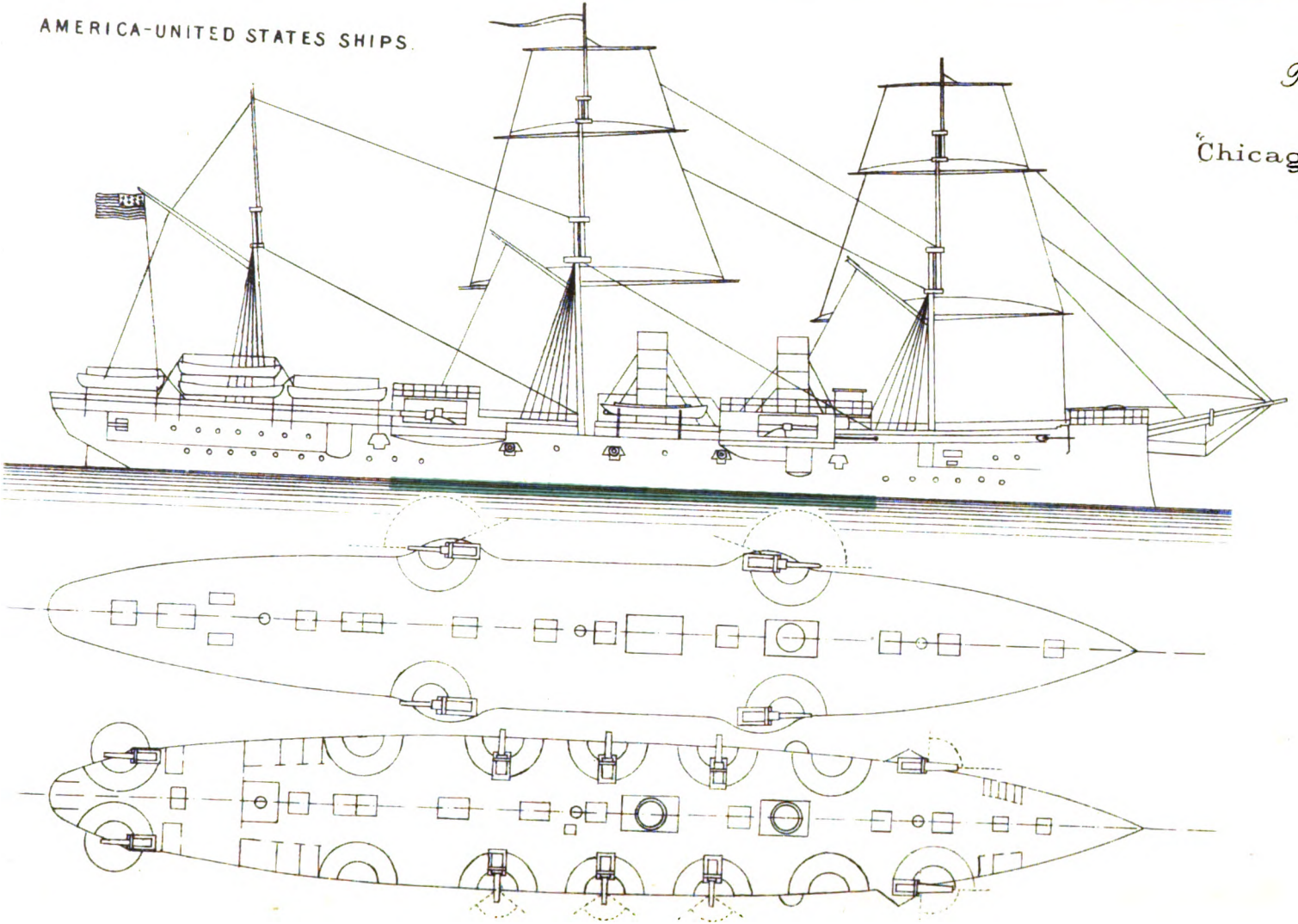
UNIV. OF CALIFORNIA

MANHART & TM

"Chicago."



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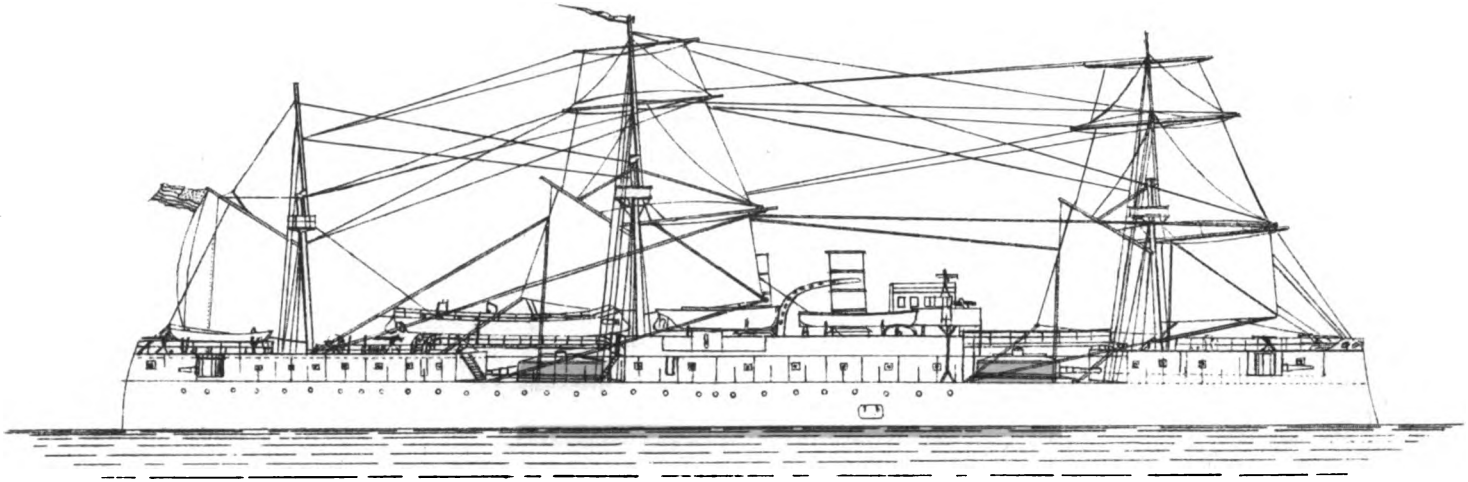
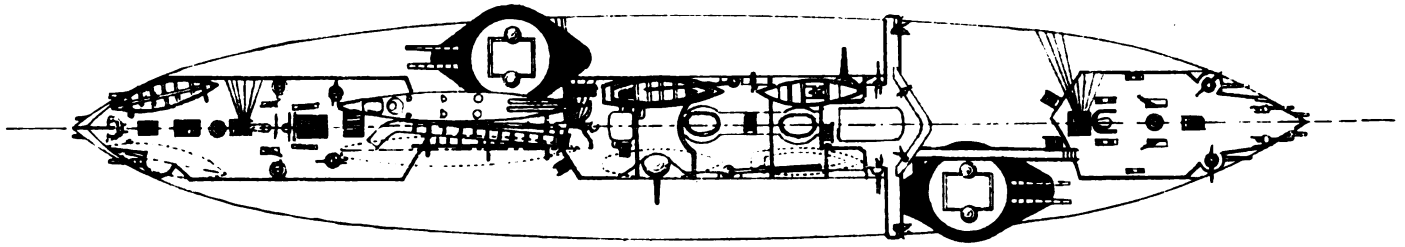
Armoured Cruiser "Maine"





Main and Superstructure Decks

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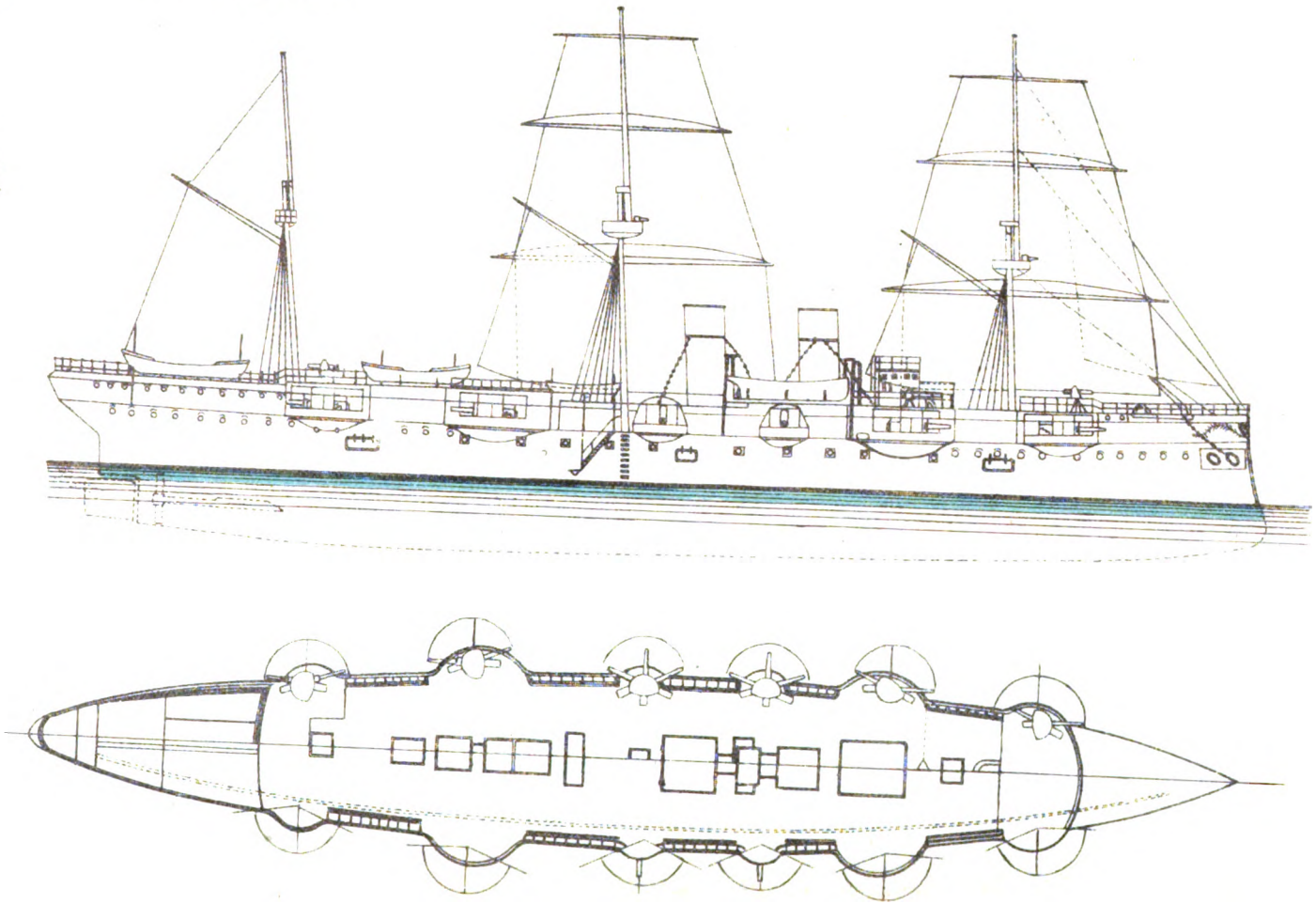
"Newark"



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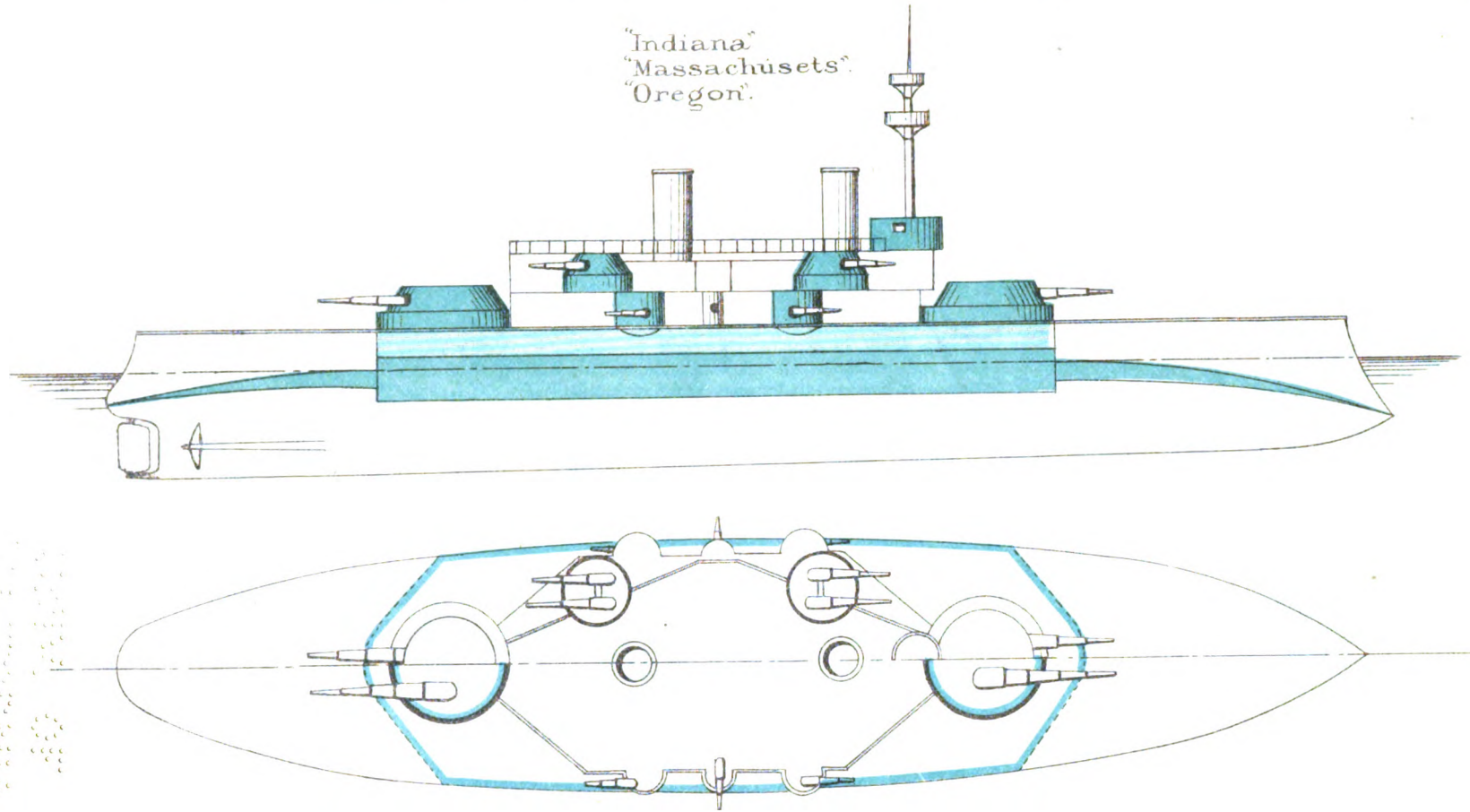
"Indiana"
"Massachusets".
"Oregon".



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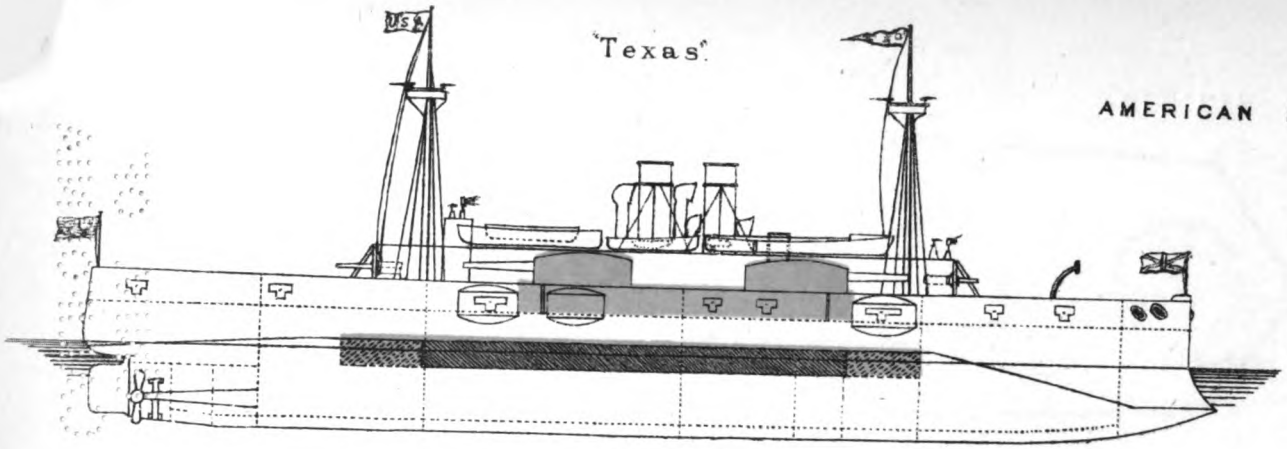
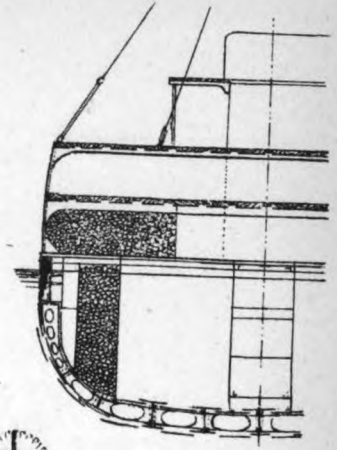
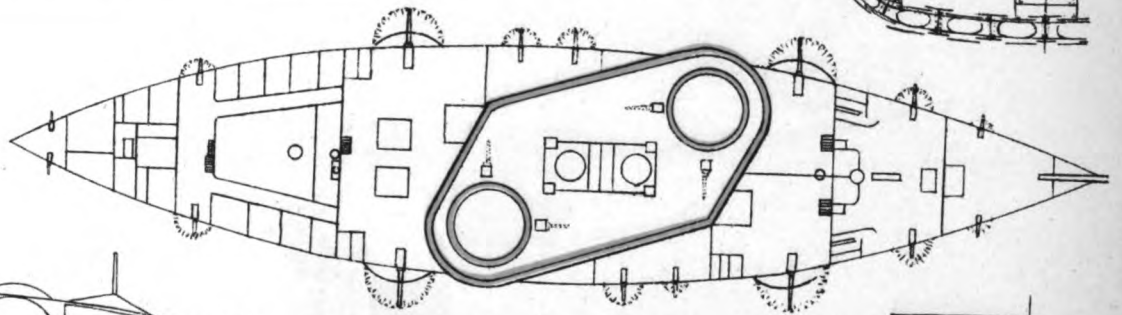
HANHART LITH

AMERICAN SHIPS.

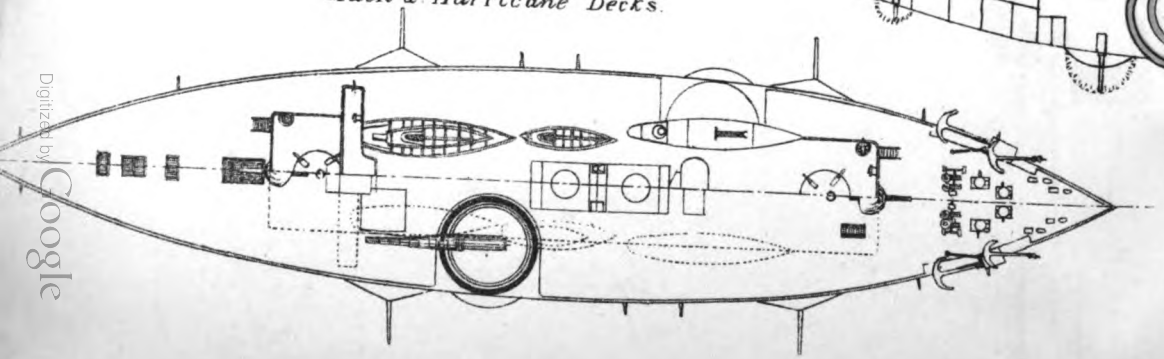
"Texas"

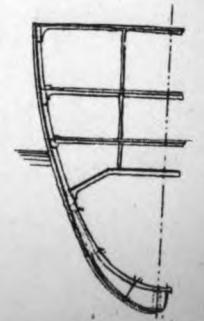






Main & Hurricane Decks.





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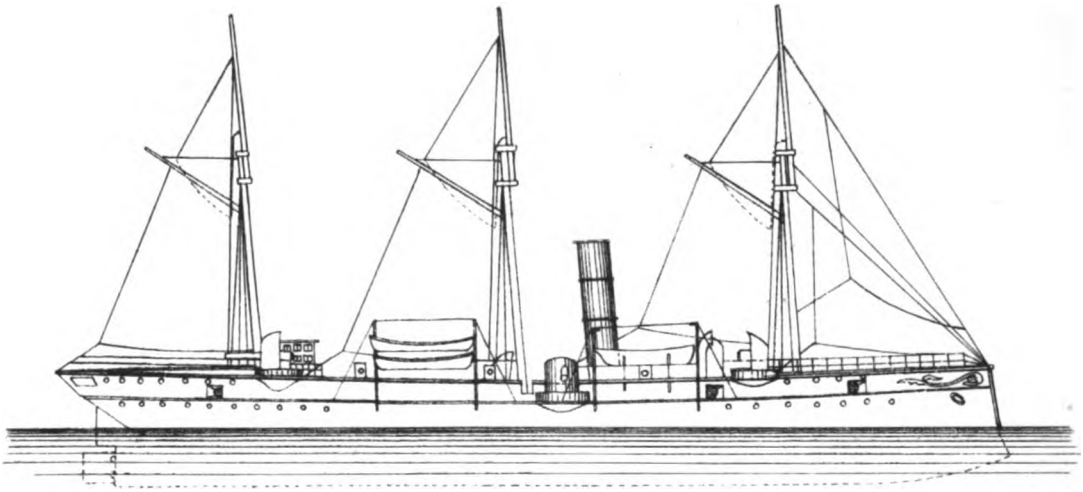
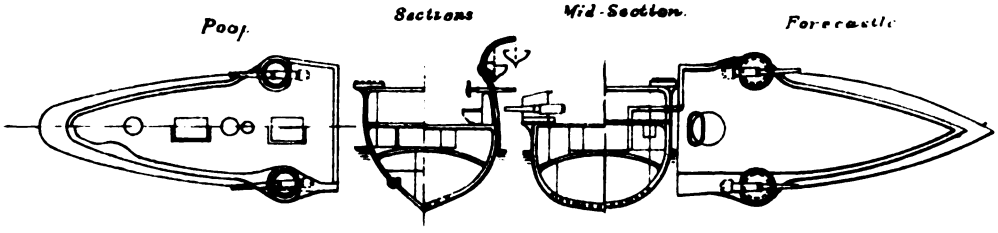
AMERICA—UNITED STATES SHIPS.

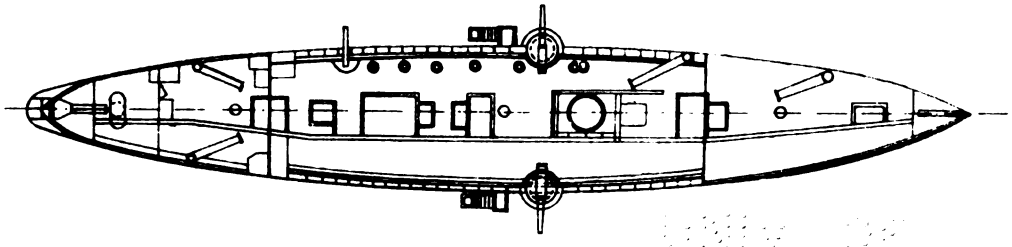
"York Town"

Torpedo Cruizer of 1700 Tons Displacement.





(Upper Deck)



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PART III.

ARMOUR AND ORDNANCE.

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PART III.

Armour and Ordnance.

I.

Armour and Armour Experiments.*

Gruson's experiments of 1890.

In September 1890 Gruson carried out a remarkable programme of experiments at Tangerhütte, near Magdeburg, with shielded mountings and quick-fire guns of different classes. Representatives of nearly all the naval or military powers of the world were invited to attend these trials. The experiments with turrets and shield mountings, which were the designs of chief interest, are only of secondary importance to naval officers. As, however, Gruson has erected most of the armoured coast forts existing, it follows that if the British Navy were ever called upon to attack a foreign coast, Gruson's shields or cupolas might probably form an important element in the enemy's line of defence; so that a few words on the general features of Gruson's designs may not be out of place apart from the strictly naval part of the programme referred to, which consisted of the trial of quick-fire guns on naval mountings. The whole of the firing was carried out on the shooting-ground at Tangerhütte near Magdeburg. The best known Gruson structures are the cupolas and batteries of chilled iron, such as are erected on the Weser and the Scheldt. These scarcely entered the Tangerhütte, programme, and there is nothing to be said on them beyond the directions given in each *Naval Annual* on the attack of hard armour, except that the fact should be borne in mind that the glacis may prove to be the weakest place in a cupola, especially if the fire is continued for long. All guns firing armour-piercing or common shells are available for its attack; it does not revolve and so put

* *List of Authorities*: *Engineer*, for plates and accounts of trials, *Journal de la Marine*, *United Service Magazine*, the U.S. *Engineer*, *New York Sun*, and other American papers, Mr. L. Delbos, H.M.S. Britannia, besides direct communication with manufacturers.

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itself out of fire, and if the granite glacis slope and its supporting shield or "vorpanzer" be perforated, as at Bucharest, the attack is completely successful. It is a question whether any effect could be produced on Gruson's chilled iron defences in a short attack. (See *Naval Annual*, 1886, p. 319.)

The designs which were most prominent at Tangerhütte were the so-called shielded mountings, which owe their origin to the late Colonel Schumann. These are structures made generally of steel and wrought iron, of a much lighter description than the chilled shields, and are in many cases intended to be erected in any desired spot in a few hours, when their fire might tell in an unexpected way in the defence of a place. Thus on Saturday, September 27th, a strong shielded mounting for a 12 cm. (4·72 in.) howitzer was erected in a pit that had been dug and prepared for it in one hour and forty-eight minutes by six men employing only an impromptu sort of crane easily rigged up, and other simple means. Clearly such a structure might make its appearance at any point any morning in complete fighting condition. The gun, which is a quick-fire howitzer, would be a very troublesome enemy rather than a powerful one. The structure might perhaps be crushed by the blow of a really heavy projectile, but would be probably uninjured by the attack of light or medium guns. Fig. 1, Pl. I., shows this howitzer and its mounting, but in the rapid erection contemplated, earth lined with planks would take the place of the concrete here shown.

With regard to these new structures a few definitions may be desirable to enable the reader to distinguish the classes of shields apart. In a *turret* the entire structure, walls, and platform, as well as guns, generally revolve on trucks. In a *shielded mounting*, the shield or dome and gun revolve on a centre pivot, the walls remaining fixed. A *disappearing shielded mounting* only rises above the surrounding wall or glacis plate in coming into action, and after firing descends into the position of eclipse. In a *shielded emplacement*, the shield with the entire structure is a fixture, a mortar with a spherical body moves in a central hole in the shield, forming a ball joint on the top of a supporting pillar.

A disappearing shielded mounting would perhaps take the place of the above for direct fire, but these designs are generally intended for inland operations rather than coast defence; for example, there is a *movable shielded mounting*, which consists of a gun in a sheet steel cylindrical structure with an armoured roof—see Fig. 2, Pl. I., and Fig. 3, Pl. I., which is placed on wheels, and can be brought into a

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GRUSONS-TANCER HUETTE. TRIALS.

FIG. 1.

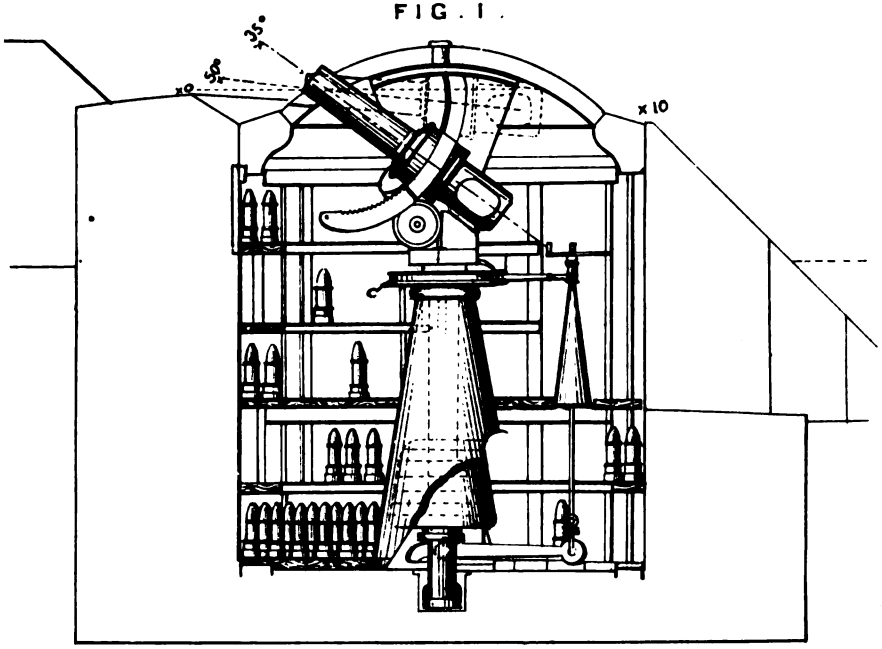


FIG. 2.

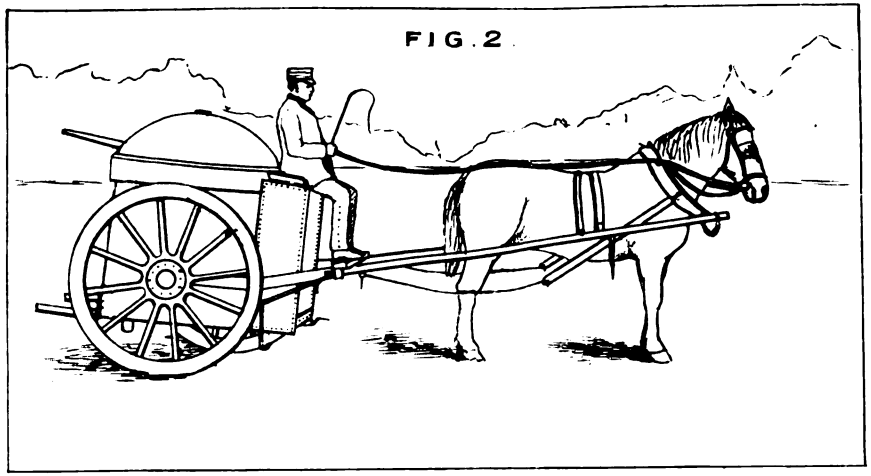


FIG. 3.

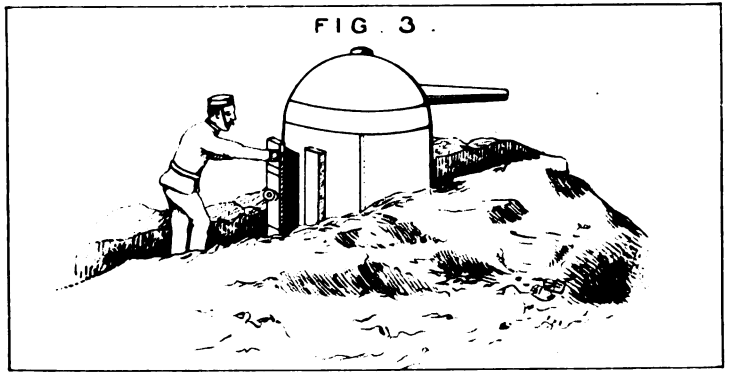
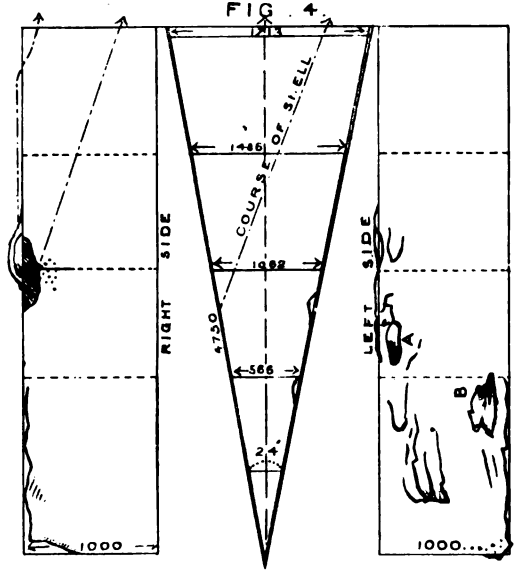


FIG. 4.



Pl. I.

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gun pit, where it assumes an extremely strong position. Thus, in the defence of a fortress fresh ground might be taken and a gun placed in a spot which might greatly annoy besiegers and prove a valuable element in defence. Smokeless powder was used throughout the experiments. (For the trials with quick-firing guns on naval mountings, see p. 322.)

American and Russian armour-plate competitive trials.

Next to pass on to ships' armour. For some years past no means have been furnished for a direct comparison of the powers of compound plates with the solid steel armour made by Schneider.* For this it has been necessary to refer to the competitions which took place previous to 1885.†

In some competitive trials, solid steel had obtained the victory; in others, it was on the side of the compound. In trials of plates up to 12 in. in thickness, the compound had the advantage, but in certain notable Italian competitions with plates 19 in. thick, the steel behaved so much better that the Italians established their national works at Terni for the manufacture of solid steel, under the direction of Messrs. Schneider; and the United States of America commenced the manufacture of solid steel armour for their navy. It will be said that these decisions were due to political or other reasons, but it should be borne in mind that such statements are easily made, and it is very difficult either to prove or disprove them; while, unfortunately, the facts brought out by the experiments referred to above, are such as might justify in many minds a preference for solid steel armour on physical grounds alone. It was, no doubt, also perfectly possible to hold that compound armour was the better. In France, where both kinds are made, and, therefore, where political and other questions were less likely to arise than elsewhere, each kind of armour is made in large quantities, although most French officers are said to be inclined to prefer the solid steel to the compound. In order to explain the relative advantages of each, it is necessary to understand their behaviour and structure. Up to 1876, ships were covered with wrought-iron only. Steel armour first came in after trials at Spezia in the end of that year, when it proved its power to stop projectiles which readily perforated wrought-iron of the same thickness. This, however, it did at the expense of a considerable amount of fracture. The British Admiralty then took up the

* The Nettle trials furnished the means of comparing English steel with English compound plates, but English steel armour was then made almost for the first time.

† The review of these experiments is reprinted substantially from the author's paper in the *United Service Magazine* for February 1891.

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question, but strong objection was felt to the fracture of the armour, and this gave a special opening for the introduction of compound or steel-faced plates, made on Wilson's system, at Messrs. Cammell's works at Sheffield. Two causes then greatly favoured the success of compound armour; one, the fact that the projectiles at the time of its first introduction were comparatively easily broken; and the other, that the Admiralty, as said above, made minimum liability to through cracks a primary condition. "We're not going to have the armour strip off the sides of our ships," they are reported to have said; "any additional hardness that can be given without this, we shall be glad to have." Hence it followed that British armour took the shape of a very soft mass with a hard *front layer*—it would be unjust to call it only a hard skin. Against such armour chilled iron shot broke with little effect. When well backed, especially by masonry, it displayed exceptional resisting power,* and it was very good against oblique fire; while, on the other hand, under the direct attack of first-class projectiles, it was apt to give slightly back at the point of impact, and to fail; while the "through steel" had more "bone" in it, and stood up better against the blow. Schneider† himself admits the resisting power of compound armour against projectiles of medium quality; and our Sheffield makers were surely aware of the desirability of having harder foundation plates, for they made experiments with soft *steel* backs‡ and hard steel faces, but so long as minimum liability to through cracks was a primary condition, such plates could never meet with approval. It is curious that England, with very little need for armour on land defences, was thus insisting on qualities that are excellent for resisting the long-continued attack of siege guns of medium size, and that this should be the policy of her naval authorities; for no ship could be subject to such long-continued or accurately conducted fire that her plates would really be stripped off her,§ for by a good system of bolting, a plate which is broken through and through, may easily be held up, and still possesses considerable resisting power. The question stood very much in this condition during the last five years without any competition taking place, such as would test the relative powers of each class of armour. Nevertheless,

* Especially seen in some engineer plate trials conducted at Shoeburyness in 1883.

† In a letter published in the *Engineer* of July 12th, 1889.

‡ In the *Engineer* of January 12th, 1883, the writer pointed out that the Sheffield patents for compound armour included steel backs as well as iron, and suggested that this was the most hopeful form of armour for the future.

§ The approval of the Inflexible construction depended on a similar assumption.

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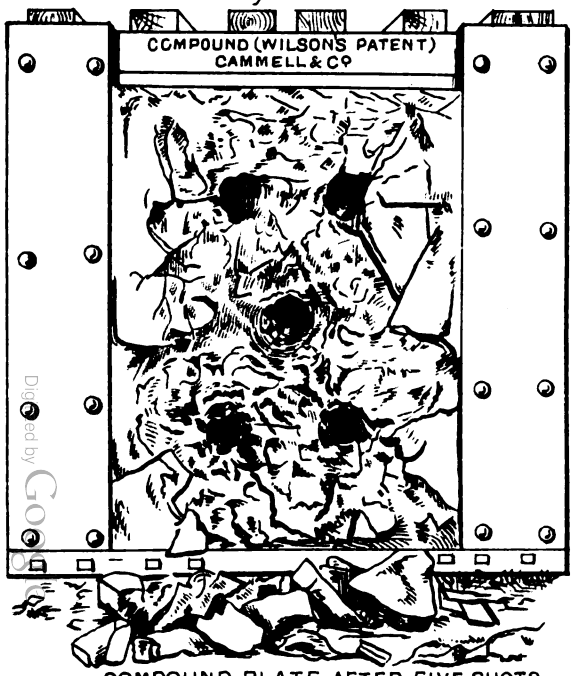
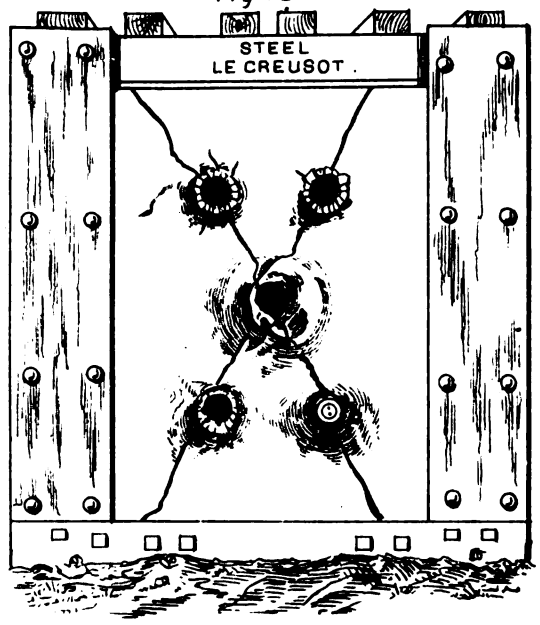
(ANNAPOLIS) COMPETITION (FACES)

Fig. 5.



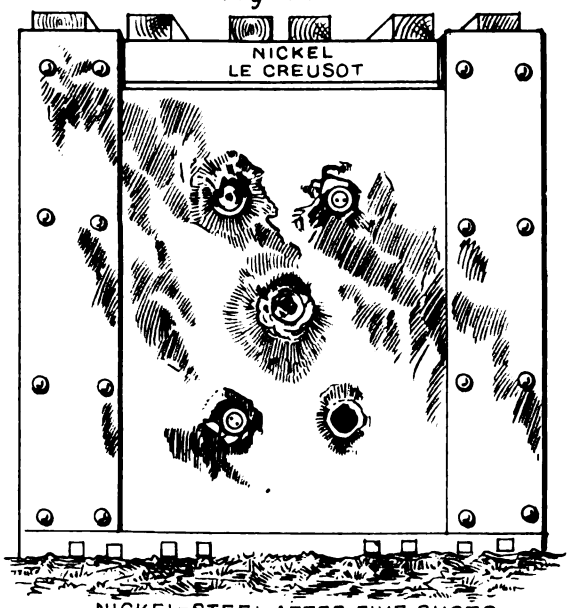
COMPOUND PLATE AFTER FIVE SHOTS.

Fig. 6.



ALL-STEEL PLATE AFTER FIVE SHOTS.

Fig. 7.



NICKEL-STEEL AFTER FIVE SHOTS.

Pl. II.

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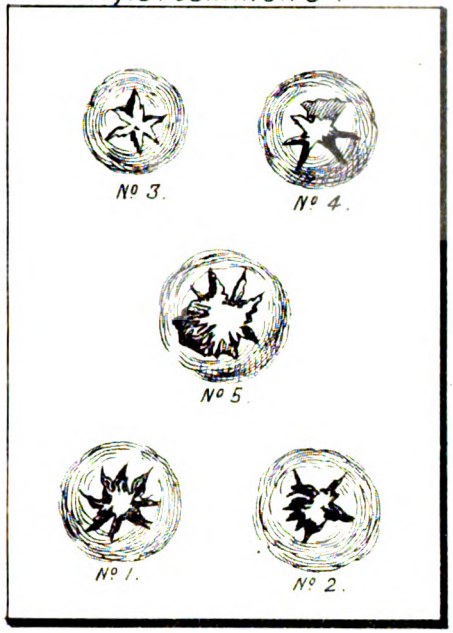
(ANNAPOLIS) COMPETITION BACKS.

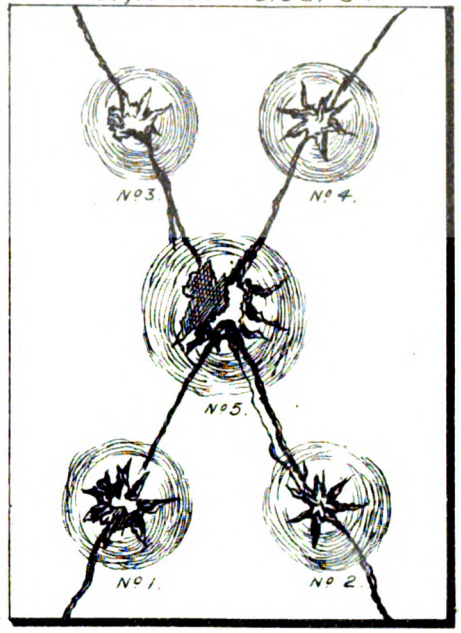
Compound Plate after being removed from backing. View showing Back of Plate after receiving four 6 in. & one 8 in. shot.

Fig. 8. Cammell's.



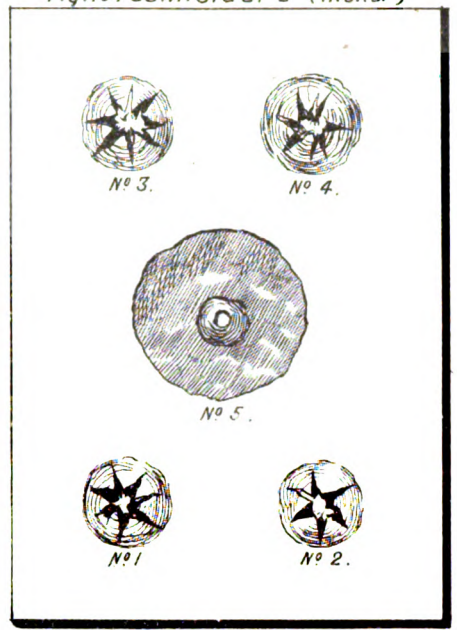
Schneider's All Steel Plate after being removed from backing. View showing Back of Plate after receiving four 6 in. & one 8 in. shot.

Fig. 9. Schneider's.



Schneider's Nickel Steel Plate after being removed from backing. View showing Back of Plate after receiving four 6 in. & one 8 in. shot.

Fig. 10. Schneider's (Nickel)



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the increasing excellence in forged steel projectiles naturally led some to wish * that our own authorities could be induced to adopt harder armour.

In 1890, competitive plate trials were instituted by the Governments of Russia and the United States. The latter took place first, being carried out at Annapolis, on September 18th and September 23rd last. Three plates were tested, each 8 ft. by 6 ft., and about 10½ in. thick, weighing about 9·4 tons. Two were supplied by Schneider—one of steel, hammered and made on his usual system; the second differing only, so far as is known, in containing 5 per cent. of nickel. Each plate, on September 18th, was subjected to the attack of four rounds from a 6-in. gun, each with a Holtzer forged steel projectile weighing 100 lb., fired with a velocity of about 2073 ft. per second. This would, according to calculation, be equal to the perforation of 13·20 in. of wrought-iron, or 10·56 in. of steel. Should the plate shatter in preference to yielding by perforation, the work available per ton of shield was 318·4 ft. tons for each round. These four rounds were fired towards the corners of the plates, as shown in Figs. 5 to 10, Pls. II. and III. On the second day, September 23rd, one round was fired from an 8-in. gun at the centre of each plate, with a forged steel projectile, which was, of course, more than a match for the plates, and in each case perforated it. The hardest plate would suffer most from this round, as it would transmit more of the shock into the mass of the plate before it let the shot through. Yet, unless the velocity of the shot were taken after its passage, there would be no means of measuring how far each plate had resisted it. It will be seen by looking at the fronts and backs of these plates, as shown in the cuts, that the Schneider ordinary steel plate is broken across by lines through the five holes, forming an X. Nevertheless, this plate was an excellent one, stopping the projectiles with less penetration than either of the others. The nickel-steel Schneider plate stopped the 6-in. projectiles with their points hardly through the plate; while the 8-in. penetrated about 10½ in. into the backing, and it was free from cracks. The Cammell, or Wilson, compound plate allowed of

* See p. 158, Part I. of the writer's work on 'Armour, and its Attack by Artillery':—"Should projectiles improve in quality, the plates may have to be made harder. In the long run, it seems probable that hard rather than soft armour will be preferred. Those who are not themselves engaged in manufacturing plates may probably wonder that compound armour, consisting of a hard steel face and tough steel foundation or body, has not before this been successfully made." This was written about 1884. In 1888 the writer formally wrote to the Admiralty, pressing the adoption of harder plates, at all events, for cruisers, and advocated the same in the Institution of Civil Engineers in the following spring.

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most perforation by all the projectiles, the 8-in. shot passing clean through three feet of backing, into the mound behind. It had no "through cracks," but its face broke away to a great extent, as shown in the front view. The general feeling seems to have been that the nickel-plate was the best of the three, and that the compound was altogether inferior to both the steel plates.

The Russian competition took place at Ochta, near St. Petersburg, on November 11th last, and very closely resembled the American trial in its conditions. One compound plate being sent by Messrs. Brown, made on the Ellis system, and two "all steel" plates, one of Schneider's, which was found by subsequent analysis to contain 3 per cent. of nickel, and a plain steel plate made by Vickers, of Sheffield. Each plate was 8 ft. by 8 ft., and about 10 in. thick; the weight being about 11·7 tons. Five forged steel projectiles were fired at each, two near the top corners, with a velocity of about 1984 ft., and two near the bottom corners and one at the centre, with about 2080 ft. The projectiles each weighed approximately 89·38 English lbs.; they were made by Holtzer's men in Russia. The first two fired at each plate were a little softer than was desired by Holtzer; the last three were most excellent. It need hardly be said that a projectile which will strike at the plate with over 2000 ft. velocity and rebound, scarcely affected appreciably in form, must be one of the best quality, and this is what occurred generally on this occasion. The calculated perforation of the two projectiles first fired at each plate is 11·93 in. of iron or 9·54 of steel, and of the three last 12·50 in. of iron or 10·00 in. of steel. The respective energies per ton of plate being 206·3 and 229·2 ft. tons. The test was, therefore, less severe than at Annapolis, but very closely resembling it. The figures 11, Pl. IV., to 16 Pl. V., show the fronts and backs of the plates at the conclusion of the firing. Here, again, the compound plate was completely perforated by the three last projectiles which all passed through the backing, and went on for a considerable distance, and it was badly fractured all down one end. Its face, however, was not broken away to any serious extent. The Schneider nickel-steel plate behaved very much in the same way as the Schneider plate without nickel in America; that is to say, it was the hardest of the three tested, and kept back the projectiles best, but it broke up badly, being in fact in pieces at the end of the trial. The Vickers' steel plate without any nickel in it corresponded to the nickel-steel plate in America; that is to say, it allowed the points of the projectile to come through, but it held together intact, although one corner was nearly detached by through cracks, and any who pre-

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OCHTA-COMPETITION FACES.

Fig. 11. Brown.

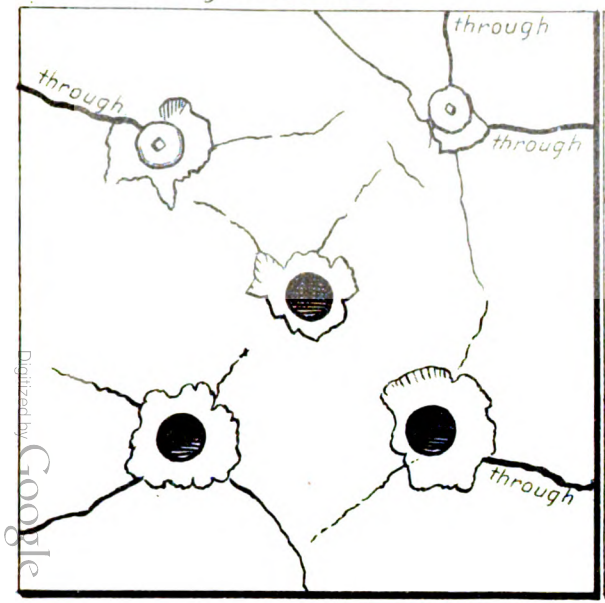

Fig. 12. Schneider.

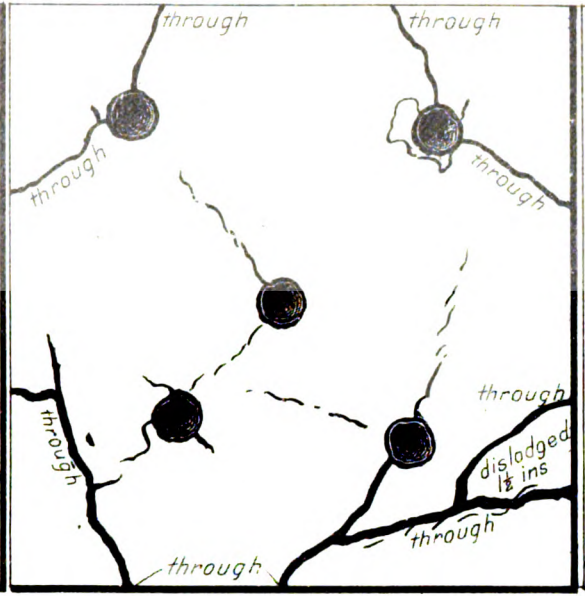

Fig. 13. Vickers.

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OCHTA-COMPETITION BACKS.

Fig. 14. Brown.

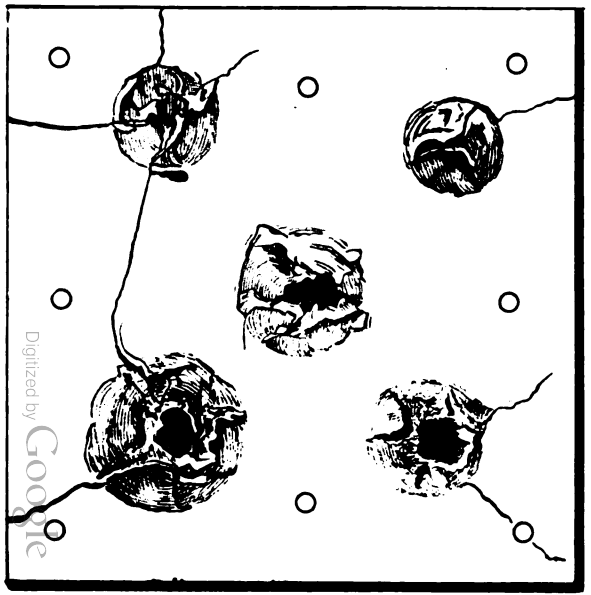
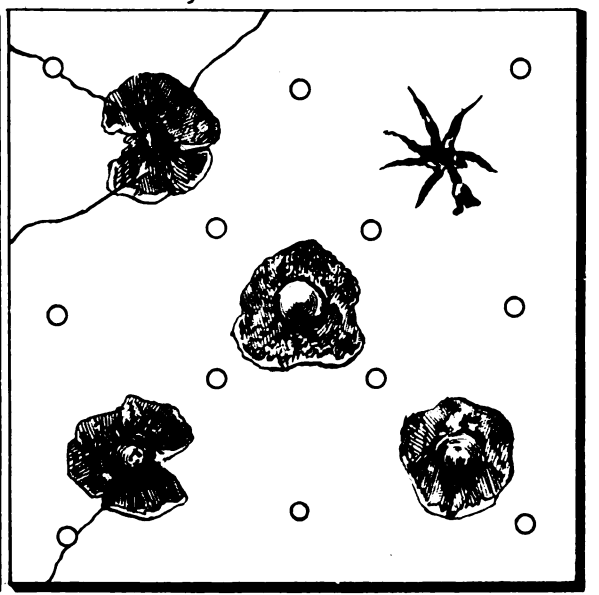


Fig. 15. Schneider.

Fig. 16. Vickers.



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ferred the nickel plate in America, ought to prefer the Vickers' plate in this trial. It was stated by M. Barba in his paper read before the Institution of Naval Architects in last March, that the Russian authorities gave the first place to Schneider's plate, but they gave an order to Messrs. Vickers for armour for two gunboats. Two compound plates, made at the Kolpino Works on Wilson's system, were fired at at Ochta, one before and one after the competition. The former kept out the projectiles remarkably well, apparently behaving better than any of the competing plates; but it appears that some, if not all the projectiles fired, were inferior to those employed in the competition in a greater or lesser degree. Thus, admirable as the plate appeared to be,* it is impossible to estimate its powers satisfactorily. Of the second Russian compound plate also it is difficult to speak, seeing doubt exists as to the quality of the projectiles. Judging from a photograph obtained and from the data supplied, the plate behaved very well.

The facts thus given of the above-mentioned experiments constitute nearly all the data at present available for forming an opinion on the future prospects of English and foreign armour-plates, which may now be briefly discussed. First, with regard to nickel, it may be seen that at Annapolis a plate containing 5 per cent. of nickel displayed great resisting power, both to perforation and fracture. On the other hand, at St. Petersburg, Vickers' plate, containing no nickel at all, bore the same relation to one containing 3 per cent. of nickel that had been seen in the opposite direction at Annapolis. The difference between 3 and 5 per cent. is a substantial one. This would reasonably account for much less characteristic behaviour, but not for a complete reverse in the relative behaviour of nickel steel and pure steel. It has been reported that the French Government do not propose to adopt nickel, and in America that nickel is affected so as to lose its value in frost. There was a sharp frost on the day of firing at St. Petersburg; but something much more definite than is at present known, is necessary to justify us in accepting this explanation. It is, however, reasonable to say that nickel deserves attention because Schneider, who probably knows more about its action on steel armour than anyone else, has been using it repeatedly, and in one instance, as we have seen, with marked success, although its characteristic action was not apparent on another occasion. This question has attracted special interest now because Canada is

* The writer was present at the competition, on which he wrote a report in the *Engineer*, making drawings from which the cuts of the fronts are taken. Photographs of the backs were obtained afterwards, and also published in the *Engineer*.

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suffering from the effects of the McKinley tariff. It is hoped that Canada will benefit by the sale of the nickel ore she is known to possess to the United States at a high price. It is stated on good authority that silicate of nickel is being obtained in Oregon, U.S., but this is not likely to spoil the prospects of Canadian nickel, because it exists in very small quantities.* On the whole, operations as to nickel armour are at present quite uncertain. Some of our Sheffield manufacturers, as well as Government officials, are experimenting with it, but they keep the results to themselves.

A still more important question than the value of the metal nickel, is the present position of British armour compared with foreign. The results of recent experiments show that with the best of projectiles known, our compound armour, covering all our armour-clad ships built since the Inflexible, which was completed in 1881, can be perforated more easily than certain steel when attacked by direct fire. The French ships from about the same date are protected by steel and compound in about equal proportions. No ship has nickel-steel plates up to the present time. As regards the ships afloat, the defeat of compound armour need not trouble us, seeing that the steel, which has beaten it, is the result of all the latest improvements, and steel plates on the sides of existing ships cannot be so good; next, that the test applies to the case of direct fire, and that any obliquity in the direction of the fire, such as must obtain on service, is all in favour of the compound plate with its harder face, so also is any inferiority in the projectile. Then, again, compound makers urge that steel admits of increased excellence being given, by special efforts, to a champion plate, which could not be bestowed on those supplied on a large scale. Be this as it may, there is nothing worth serious consideration in the condition of our armour afloat. As concerns the armour of the future, it is quite otherwise. Vigorous action is most necessary to restore our prestige, to keep up our trade in armour, and even to obtain the best shields for the sides of our ships; for the faults that may be disregarded in vessels hitherto completed, must become more serious as time goes on and rival armaments are brought to greater perfection. From what has been

* From information received from other sources, which can be relied on, the *quantity* of nickel that can be extracted from the Oregon mines is quite insignificant. They have been known for the last eight years. Moreover, as the ores are a mixed silicate of iron, nickel, and magnesia, sulphur has to be added to them before they can be fused, preparatory to the refining process. According to the latest news from a reliable mining engineer, "The ores are rich in nickel, but unfortunately there is very little of them." Canada has, therefore, very little reason to fear this competition; and, in fact, purchases of the Canadian nickel ore have recently been made in behalf of those who are working the Oregon mines.

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said above, it may, perhaps, be accepted by readers that our own authorities have forced English armour to take the character it now possesses—that is, having a hard face supported by soft, tough material, very difficult to break up, but comparatively easily perforated. With inferior projectiles this may have been all very well, but with those of the present day surely it can hardly be doubted that our armour is liable to perforation under conditions when foreign armour is not liable to it; and perforation, not fracture, is the danger that threatens a ship. As already said, no vessel will remain long enough exposed to attack to have her armour destroyed by shattering even by quick-fire guns, but perforation means the entrance of dead metal, and langridge or fragments into her interior, even when attacked by guns only slightly out-matching the resisting power of the armour, and it may in some cases involve the entrance of projectiles containing high explosives, which remain intact until they are inside the ship, when their explosion will indeed work havoc. Six or seven inches of armour has been already thus perforated by shells before bursting, and shells and fuses with deferred action must be expected to improve with time. It is suggested, then, that armour as hard as Schneider's plain steel plate at Annapolis, and nickel steel at St. Petersburg, would best protect a ship. On service, five rounds would be a very extraordinary number to strike one small plate, and even after five blows there remains a great power of resistance, although the plate is broken up. The protection in these two cases was very complete, and it may be seen, by examining the figure showing the back of the St. Petersburg Schneider plate, that the structure of the ship would be uninjured, and the replacing of a broken plate would therefore be a simpler matter than in the case of the softer steel plate, which appears to have been preferred in America.

Does such a conclusion mean that compound armour is to be condemned? Certainly not. If the face plate is liable to split off, no doubt the days of compound armour are numbered; but if it can be established that the face plate can be depended on to hold to the back, surely it follows that, let the foundation or back be of any quality which has a reasonable amount of toughness, it must be an advantage to give it a face of harder steel, which breaks projectiles up and throws them off, especially on oblique impact; and this means that the compound principle * is carried out, though with harder metal than at present. Supposing, however, that this is

* The original patents for compound armour specified the use of hard and soft steel as well as of steel and soft iron.

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doubtful, it is satisfactory to note that in Vickers' * steel we have as good all steel armour as is to be found anywhere, so that England is not placed at the disadvantage of appearing to be making the best of the only string she has to her bow, in persevering with compound armour. Altogether, then, it appears that there is urgent need that a radical change should be made in our armour, but there is every encouragement to hope that such a change should produce the best possible results. There is nothing at present so serious that prompt action will not remedy it.

Schneider's steel plates for Denmark.

On July 11, 1890, a trial of curved steel plates for the conning towers of the Danish vessels Tordenskjold and the Hekla. The *Journal de la Marine* states that the plate was 2·25 m. (7·38 ft.) × 1·48 m. (4·86 ft.), with a mean thickness of 112 mm. (4·41 in.). Three chilled iron projectiles each weighing 41 kg. (90·4 lbs.) were fired from a 15 cm. (5·9 in.) gun striking with a velocity of 377 m. (1237 ft.), implying a perforation of 6·4 in. of iron or 5·2 in. of steel. The projectiles were broken up with about 107 mm. (3·98 in.) penetration, the total energy of each blow being 761·5 foot-tons. There was a slight crack after the third round. The back of the plate showed very little effect. This result must be considered admirable, for the blow is more than a match for the plate as to perforation, and so large a projectile at a comparatively low velocity might not have been broken up.

Cammell's 8-in. plates for Argentine cruiser.

In February last, a plate of Messrs. Cammell made for a ship built by Messrs. Laird, of Birkenhead, for the Argentine Republic, was tried on board the Nettle at Portsmouth. The plate was a steel-faced Wilson's, 8 in. thick and 8 ft. by 6 ft. in area. It was attacked by three 6 in. Palliser projectiles weighing 100 lbs. each, striking with a velocity of 1566 ft., implying an energy of 1700 foot-tons, and a perforation of 9·8 in. of iron or 7·8 of steel. The projectile, as might be expected, broke up, producing little effect on the plate. The trial is a very ordinary one, but deserves to be noted for the following reason.

It is stated that on May 23rd, 1890, at Gâvre a steel plate measuring 18 ft. 4 in. by 6 ft. 9 in. and a thickness varying from $8\frac{1}{16}$ in. to $5\frac{5}{16}$ in., was cracked through and nearly penetrated by a similar test, and was entered as *très satisfaisant*. The case appears to be just one of those where the hard force of the compound armour

* Although harder plates than Vickers' have been here recommended, such a preference by no means implies that Vickers' steel is not equally good, for it may be assumed that it would be easy for makers to make steel of a little harder quality if desired.

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disposes of chilled shot in a much better way than the comparatively soft steel, and such cases should be kept in memory, as well as the attack with unbreakable forged steel projectiles.

Krupp's high angle trials at deck plates.

While Gruson was exhibiting the power of quick-fire howitzer fire at Tangerhütte, Krupp was carrying on trials at Meppen which have a special interest for us in England, seeing that they concern the attack of ships' armoured decks by high angle fire; and this question affects us in two ways—first because English ships are perhaps the most likely of all to be exposed to it, and secondly because we employ high angle fire as an important element in the defence of our coaling stations. If anything further were needed to point the lesson, it might be found in the circumstance that since 1879, when this branch of investigation was commenced at Meppen, Krupp has done us the honour to select English models for his targets.

The trials were made with a howitzer of new type, 28·55 cm. (11·25 in.) calibre and 11·6 calibres or 10 ft. 10·5 in. long, weighing 10·998 kg. or 10·83 tons, with a mounting of 14 tons and a bed of 45 tons. The projectiles were armour-piercing shells of from 512 lbs. to 936 lbs. weight, fired with various charges up to 57·3 lbs. of prismatic c/82 powder. The target was a horizontal armoured deck, 52 ft. by 13 ft., composed of four steel plates riveted together, the three upper ones making up a thickness of 76 mm. (2·99 in.), and the lowest 13 mm. (0·51 in.); the total thickness was therefore 3½ in. This was backed with iron ribs and wood, and firmly supported at a height of 5 ft. from the ground.

A series of ten rounds was fired at 45 deg. elevation, with steel armour-piercing shells weighing 661 lbs., and a charge of 25 lbs. of pebble powder. The range was 3870 yards, or 2·2 miles. The greatest longitudinal deviation was 95 ft., and greatest lateral deviation 27 ft. One hit was obtained with a longitudinal deviation of 6¼ ft., and a lateral deviation of 19 in. The striking velocity was 610 ft., and the angle of incidence was 46½ deg. The target was pierced, and the supports bent considerably; ten rivets were loosened, and plates bent in about an inch in the centre; the projectile was found uninjured at a depth of 5 ft. in the earth. The second of the shots—striking the target (?)—was one of a series of sixteen fired with an elevation of 63 deg., and a charge of 33·8 lbs., the range and projectile being the same as before. The greatest longitudinal deviation was 105 ft., and the greatest lateral deviation 88 ft. One hit was obtained, of which the longitudinal deviation was 5 ft., and lateral 20 in. The striking velocity was 751 ft., and the angle of

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incidence 66 deg. The target was again pierced, and the centre of it depressed nearly 2 in. Thirteen rivets were displaced, and the supports were seriously bent. The projectile was found uninjured 15 ft. to the rear of the hole, and 4 ft. deep in the earth.

Experiments, we are informed, "were also tried against steel targets, inclined at an angle of 45 deg., and placed at a distance of 165 ft. from the howitzer. The horizontal target had represented the summit of the curved deck of a cruiser; the inclined target represented the slopes of that deck, and two of them were experimented with. One was 114 mm. (4·48 in.) thick, and measured 8 ft. by 6¾ ft.; the other was 89 mm. (3·5 in.) thick, and measured 6½ ft. each way. Both were well backed with pine, and firmly supported, and both were easily pierced by the projectile from the new howitzer. Finally, experiments were conducted in order to obtain full ballistic and other details concerning the weapon, and to these ends 253 rounds were fired. The following are particulars of three representative rounds:—

Powder Charge.	Projectile.	Muzzle Velocity.	Pressure per sq. inch.
lbs.	lbs.	Foot-seconds.	Tons.
40·7 pebble . .	661	857	14·9
40·7 prism . .	661	771	9·5
57·3 prism . .	661	1020	14·4

"Of the two series, of twenty-six rounds in all, twenty projectiles would have fallen upon the target if, instead of measuring what it did, it had been of the shape and superficies of, say, the Centaur's deck, about 360 ft. long by 60 ft. maximum breadth."

That the gun thus fired was more than a match for most of our ships' decks goes without saying. The following features, however, must be noticed: first, the best armour-piercing projectiles were used; secondly, the conditions represented are those of a vessel in a stationary position; and thirdly, the howitzer, including its mounting and platform, is represented as weighing about 70 tons. The idea of deck attack has hitherto been the application of comparatively inexpensive, unarmoured batteries, in which the presence of a piece of this power, especially firing steel projectiles, is hardly contemplated. The time of flight of the second series of rounds fired at 65 deg. is not given. This is an important element in the conditions, for it not only affects the question of motion, but the liability to error from the effect of wind. To come to the point, however, it appears probable

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that the piece in question would both strike and perforate the decks of most war vessels lying at anchor in a large proportion of any rounds fired with steel armour-piercing projectiles. A blind forged steel projectile would not readily break, but so crowded are our decks with heavy machinery that it seems very unlikely that it would effect more than a certain amount of mischief in the way of fracture, especially as it does not fall truly point first, and its path is not nearly vertical. A forged steel projectile is so expensive that hitherto its use has not been contemplated in deck attack. Next, suppose a forged steel projectile to be fired with a bursting charge of some high explosive, this would undoubtedly effect terrible mischief locally. Lastly, suppose common shells to be fired, the damage would be probably in a higher region of the ship than in the case of the forged steel armour-piercing projectile; but the bursting charge would be larger, and it appears probable that coast batteries will be supplied with common shells either of steel or cast iron rather than with armour-piercing ones. Hitherto results obtained with high angle fire have led authorities in this country to regard it mainly as a means of compelling ships to keep in motion, by which their powers of offence against the shore are greatly limited. Common shells effect enough injury for this purpose, so that Krupp's experiments, interesting and valuable as they are, gain little from the employment of forged steel projectiles.

Armour-piercing projectiles.

At the present time Holtzer's forged steel projectiles are taken as the standard both in Europe and America. Those of Firminy are excellent, whether supplied directly or manufactured in this country either by Firth or at Elswick. Messrs. Hadfield, however, deserve notice as having made projectiles which have behaved equally well, and as having developed their successful manufacture altogether themselves, instead of working on a process obtained from abroad. Messrs. Hadfield have made very good *cast* steel projectiles, which should be kept in view for war contingencies, though forged steel projectiles only are employed in experiments, and are to be preferred. It is, however, to be remembered that trials with forged steel 6-in. projectiles, which can be made almost unbreakable, represent the projectile behaving in the best possible way, for with larger projectiles and with less special selection, less perfect action must be expected. Common shells are made more and more of cast steel, which enables a larger bursting charge to be employed.

Holtzer's projectiles.

The following results are reported as obtained with Holtzer's forged steel chrome projectiles in Russia.*

* Communicated by L. Delbos of H.M.S. Britannia.

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On March 23rd, 1890, a projectile weighing 344 kg.* (758·4 lbs.), perforated a Kolpino compound plate (Wilson's patent), measuring 5 ft. × 5 ft. × 18½ in., breaking the frame-work and passing on 2 kilometres unbroken or cracked and only slightly deformed. A projectile from the Franco-Russian Ironworks, fired at a similar plate under similar conditions, broke up, making an indent of between 10 and 11 in.

On April 24th, 1890, another Holtzer projectile was fired at an iron plate 15½ in. thick, at an angle of incidence of 25° (presumably with the normal). The velocity was 1185 ft., the shell penetrated 12½ inches and fell back uninjured beyond slight deformation.

Holtzer's breast-plates. Body armour.

Holtzer has made breast plates of chrome steel, over 10,000 have been made at Chatelherault. They resist the fusil Gras bullet at short distances. The weight of each is 8 kg. (17·6 lbs.). The plate measures 60 × 57 cm. Its thickness is 4 mm. in the middle and 2 mm. at the side edges.

Plates of the same metal 4 mm. thick are used for shields on decks and in tops for men working quick-firing guns in the French Navy. These resist the hardened lead bullet of the "fusil Gras" with 450 metres velocity at 10 metres distance. For a small-bore firing with a velocity of 600 metres, the thickness must be increased in some cases to 6 mm. These plates are pierced and bent cold without cracking if the radius of curvature does not exceed the thickness of the metal.

For turret cupolas, plates 2 metres × 1 metre × 15 mm. are employed. At Sevran Livry the following results were obtained without perforation: (1) A 15 mm. plate resisted a steel 37 mm. Hotchkiss bullet 510 grammes fired with 321 m. velocity; (2) a 20 mm. plate resisted a 37 mm. 510 gm. bullet with 373 m. velocity; (3) a 30 mm. plate resisted a 47 mm. projectile weighing 1·13 kg. at 445 m., and also a 47 mm. projectile weighing 1·49 kg. with 350 m. velocity; (4) a 50 mm. plate resisted a steel projectile 47 mm. weighing 1·49 kg. with a velocity of 560 metres.†

* Probably from the long 12 in. gun (see Russian Table of Ordance). The velocity is not given; 1900 ft. would suffice probably for the work implied. The chief feature of interest is the fact of the projectile being a large one instead of one of 6-in. calibre.

† Undoubtedly these steel plates will be used more and more extensively on board ships, and perhaps in trenches, but steel will be needed of very excellent quality indeed to have any future as body armour. An examination of the armour of the 17th century will show that the wearer's life was very frequently saved by the thick breast-plates and even by the thin back-plates then worn, judging from the bullet marks on them. In Dover Castle is a pair of plates of which the breast-plate has stopped a very large heavy ball, and the back has stopped two pistol balls. If ever bullet-proof armour were to answer, it would have been then, when cavalry

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The general rules for the attack of armour may be here again repeated. Rule of thumb as to firing at armour.

The following *rule of thumb* for armour piercing admits of proof on certain assumptions, and may be found useful.*

Take the calibre of the gun as a measure of the armour, and it will be found that no shot can perforate a plate unless it has over 1000 ft. velocity for each calibre in the thickness. Thus an 8-in. projectile must have over 1000 ft. striking velocity to perforate an 8-in. plate. It must have over 1500 ft. velocity for a 12-in. plate, over 2000 for a 16-in. plate, and so proportionally.

For many new-type guns firing projectiles heavy in proportion to their calibre, the direct perforation is very close to one calibre for every 1000 ft. striking velocity.

In *oblique fire* the perforation is found by multiplying the direct perforation into the sine of the angle made by the axis of the shot with the face of the plate, unless this angle becomes too oblique for the shot to bite, which will generally be the case below 45°,† even with armour below the power of the shot. At sea this calculation is seldom useful, because the angle of incidence is seldom known,‡ so that the maximum effect possible (*i.e.* direct perforation) is more important. In a siege, however, oblique perforation might be required. Oblique fire.

Old-type guns and a few new guns firing projectiles of large calibre in proportion to their weight have less penetration than that given by the above rule; while guns discharging projectiles, like some of Krupp's, with a calibre which is very small in proportion to their weight, may obtain greater perforation than given by the rule of thumb if fired under very favourable conditions.

On the whole, then, it may be concluded that it is useless to fire at wrought-iron plates with less than 1000 ft. striking velocity for each calibre in the thickness of the plate attacked, further allowance being necessary with old-type guns, in oblique fire, and also some allowance for backing.

For immediate use in connection with service guns, projectiles and charges, the late General Inglis prepared a diagram on which perforations can be read off at a glance. If the charge differs from that Diagrams.

---

fired into each other at sword's length with inferior pistols. Hitting was apparently very frequent, but the bullet was easily stopped. If armour was given up under these circumstances, it is difficult to conceive its being used with success now, except as shields.

* For more full directions, see *Annuals* for 1886, 1887.

† With steel-faced or steel armour the limiting angle is about 35° with the normal, or 55° with the face of the plate.

‡ A vessel attacking a fort might increase the resisting power of her side armour by maintaining an oblique position.

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specified on the diagram, the perforation for any given velocity is correctly shown, but the range at which this is marked will no longer be correct.

General Maitland made a diagram which may be employed for any question of perforation of iron. It is less quickly used and less simple than that of General Inglis, but it is available for experimental and irregular conditions, it gives more information than any other, and in using it an actual process of calculation is mechanically performed which is perhaps more perfect in theory than any other known in England.*

The diagrams, Pls. VI., VII., VIII. and IX., are based on a series that owe their origin to the official one prepared by Colonel Noble in 1873, and are corrected up to date. Foreign ships were given by Captain Grenfell, R.N., in *Engineering*, and have been shown for some years past in the Austrian *Marine Almanack* as well as in the *British Navy*. To give to these diagrams a definite practical character, the following course has been followed.

On the supposition that 3000 yards is the maximum range at which side armour will be systematically attacked, all projectiles perforating up to 3000 yards are shown with a clear blank hole. For every perforation effected only at shorter ranges, the limit of range is entered in or near the hole. Thus, any officer finding armour corresponding to that of his enemy with a blank hole opposite his gun on the diagram, may hope to perforate *with a direct hit* at least up to 3000 yards. Should he find a number less than 3000 yards entered, he must not expect to perforate beyond the range so entered.

The armour is wrought iron. It is only approximately representative. The types are chiefly French. The perforation includes backing and skin.

General Maitland's diagram has been used for calculating loss of velocity at each range. On service each hit would have less power to perforate than is indicated on the diagrams, in proportion as it strikes more obliquely.

The diagrams must be regarded as only approximate. They may, however, be of practical value, for an officer may be able to see at a glance that some ship's armour is *well within the power of his guns* or *quite beyond them*, and behave accordingly.

* Major Willoughby, R.A., has submitted a slide-rule to the Ordnance Committee, by which problems in plate-firing are worked mechanically by logarithms divisions on scales rapidly. This offers great advantages in simplicity, in speed, and in portability.

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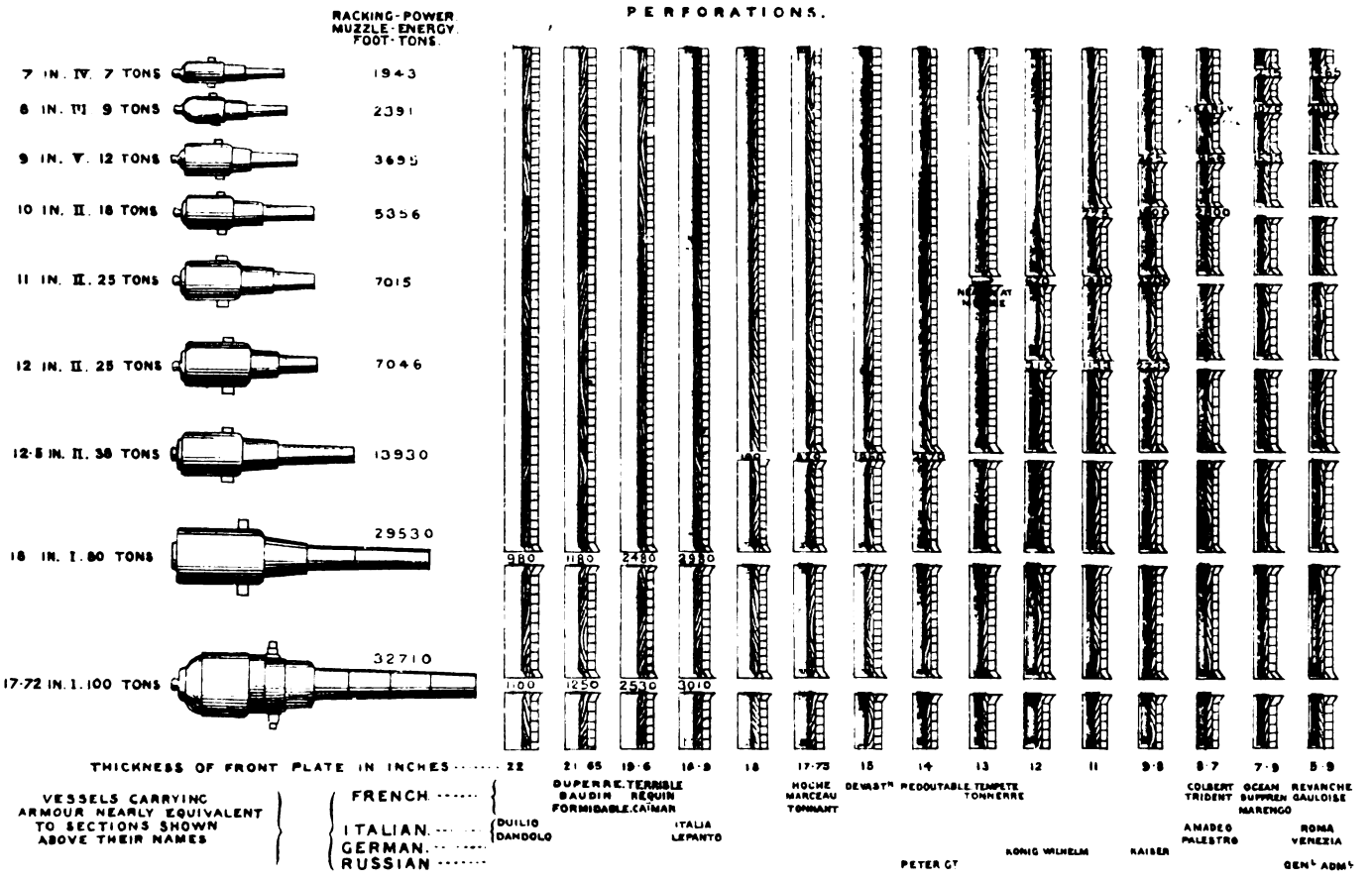
BRITISH M.L. GUNS.



A HOLE WITHOUT FIGURES MEANS PERFORATION UP TO 3000 YARDS: MAXIMUM RANGES OF PERFORATION LESS THAN 3000 YARDS ARE MARKED IN FIGURES.

SCALE - 20 FEET TO AN INCH. SHADED GUNS ARE CORRECT IN GENERAL OUTLINE, DOTTED GUNS ONLY AS TO LENGTH.

ALL BACKING IS 18 IN. OF WOOD WITH 1½ IN. SKIN.

Pl. VI.

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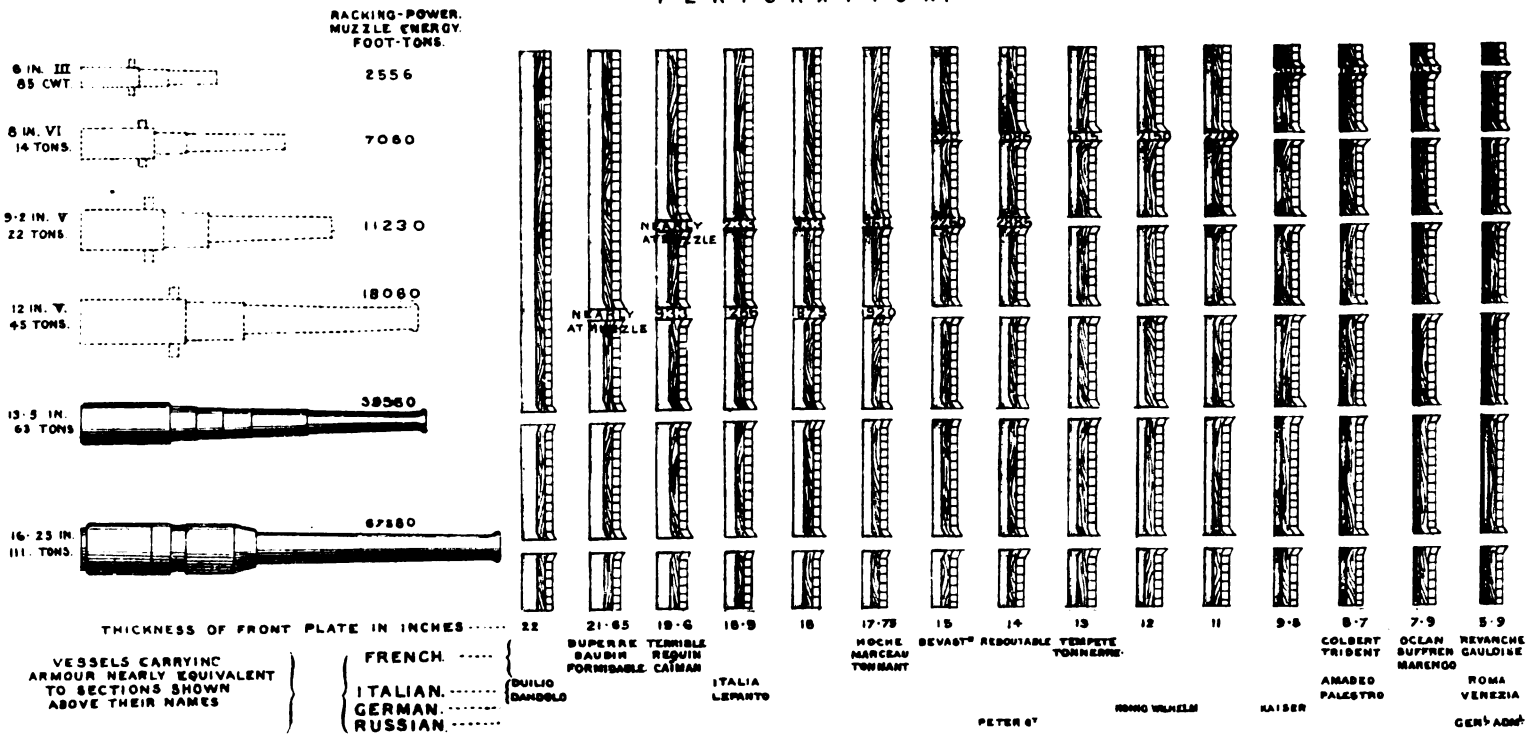
BRITISH B.L.GUNS.

PERFORATION.



A HOLE WITHOUT FIGURES MEANS PERFORATION UP TO 3000 YARDS: MAXIMUM RANGES OF PERFORATION LESS THAN 3000 YARDS ARE MARKED IN FIGURES.

SCALE - 20 FEET TO AN INCH. SHADED GUNS ARE CORRECT IN GENERAL OUTLINE, DOTTED GUNS ONLY AS TO LENGTH.

ALL BACKING IS 18 IN. OF WOOD WITH 1½ IN. SKIN.

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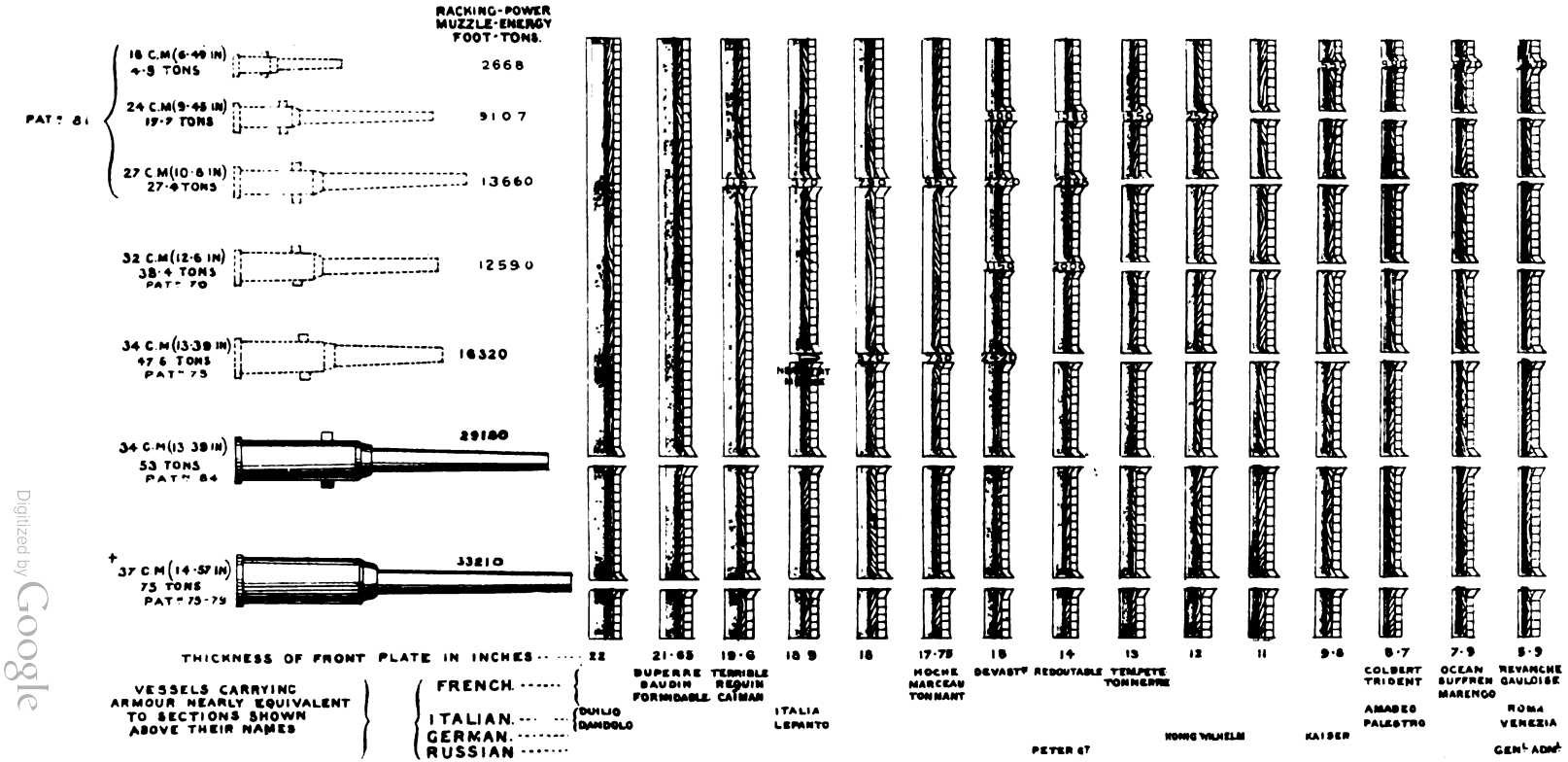
FRENCH GUNS.

PERFORATIONS.



A HOLE WITHOUT FIGURES MEANS PERFORATION UP TO 3000 YARDS: MAXIMUM RANGES OF PERFORATION LESS THAN 3000 YARDS ARE MARKED IN FIGURES.

SCALE - 20 FEET TO AN INCH. SHADED GUNS ARE CORRECT IN GENERAL OUTLINE, DOTTED GUNS ONLY AS TO LENGTH.

ALL BACKING IS 18 IN. OF WOOD WITH 1½ IN. SKIN.

† A GUN OF 42 C.M OF OLDER TYPE PATTERN 1875, WEIGHING 74·6 TONS IS SHOWN IN TABLE WITH MORE ENERGY THAN THE 37 C.M. GUN HERE DEPICTED, AND NEARLY EQUAL PERFORATION SEE TABLE OF FRENCH NAVAL ORDNANCE.

PL VIII.

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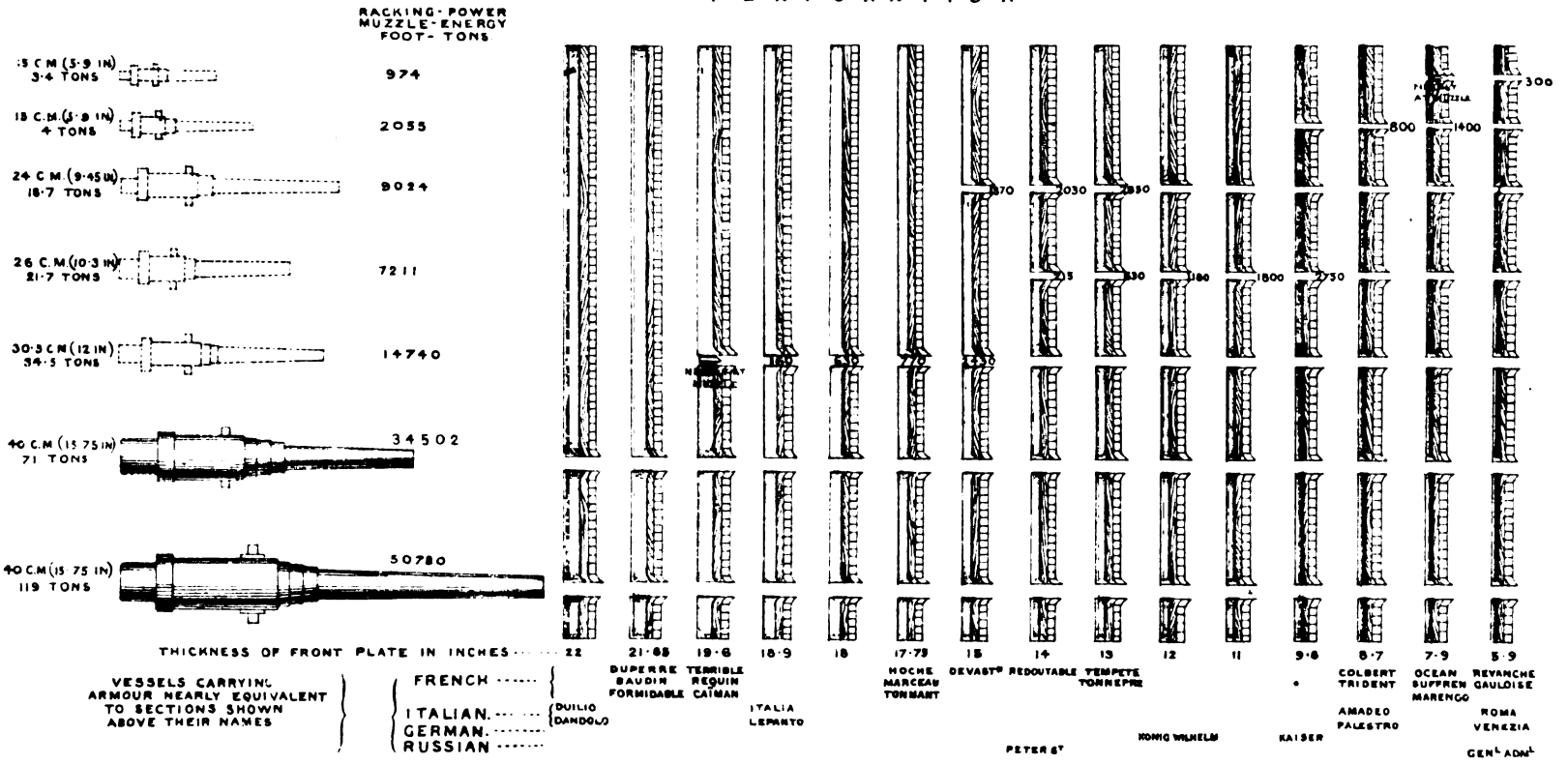
GERMAN GUNS

PERFORATION



A HOLE WITHOUT FIGURES MEANS PERFORATION UP TO 3000 YARDS: MAXIMUM RANGES OF PERFORATION LESS THAN 3000 YARDS ARE MARKED IN FIGURES.

SCALE - 20 FEET TO AN INCH. SHADED GUNS ARE CORRECT IN GENERAL OUTLINE, DOTTED GUNS ONLY AS TO LENGTH.

ALL BACKING IS 18 IN OF WOOD WITH 1½ IN. STEEL

PL IX.

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All armour-clad vessels built prior to 1876, and many subsequently, are *iron*-plated. To these the above directions apply. The question may naturally be asked, why ships clad in steel and compound armour are treated as if only sheathed in the same thickness of wrought iron. The reply is that the object is to furnish a low limit for guns available for attack. In experimental firing, steel and compound plates have often been attacked and have suffered when projectiles have been employed just capable of perforating wrought iron of the thickness of the steel in question. The yielding is more or less by fracture, and is a gradual process; still it would not be right to fix the limit higher, and to say that guns capable of such effects were useless for attack of such armour. Moreover, no other limit could be taken, seeing that some very soft steel armour exists approaching wrought iron in quality, though how closely it is impossible to say.

Thus it may be laid down that steel or steel-faced plates may be attacked by guns capable of perforating wrought iron of the same thickness as the plates in question. There will, however, be gradual destruction instead of perforation.

Hard armour.

Hard armour, then, including chilled iron and perhaps some of the harder steel and compound plates, cannot be perforated, and must be broken up before the structure behind it can be injured materially. A single hit will seldom do more than injure the armour itself. The harder kinds of such armour would suffer more than wrought iron from the continued fire of comparatively light guns. The smashing effect of a projectile on hard armour is probably in proportion to its *total energy*, irrespective of calibre.* It is difficult to apply any rule to the case of hard armour, but it is desirable as far as possible to concentrate and continue the fire about the same spot, and all guns are available for such work. Such an operation may seldom be feasible in engagements between ships.

* How greatly the power of guns to "smash" hard armour may differ from their powers of perforation may be seen by the fact that the 10-inch old-type, and 6-inch new-type guns on board the Nettle have nearly equal perforation, while the former has double the energy or smashing power (*vide* Diagrams) of the latter.

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II.

ORDNANCE.*

THE development of ordnance, in the direction of increased length and the attainment of higher velocities, has continued up to the present time. The 10-in. breech-loading gun of 32 calibres length, shown in the table of British Rifled Ordnance in the Service, is left far behind by new designs, both in England and abroad. To give examples: the Russian 6-in. gun fired at Ochta last November was 35 calibres long. That employed at Annapolis in America appears to have been a little over 34 calibres in length, while M. Canet, at works of *les Forges et Chantiers de la Mediterranée*, has long had guns of still greater length, such as a 32-cm. (12·6-in.) gun, 40 calibres long, with 2297 ft. muzzle velocity, for armoured barbette towers and a quick-firing 15-cm. (5·9-in.) gun, 48 calibres long. The exact proportions of our guns may perhaps be affected by the action of the "cordite," or whatever smokeless powder may be adopted. In the meantime, it is satisfactory to note that we (except in the recent accident reported from Australia, of which we have no full report at present) have not had any serious trouble for a long time past with our new-type guns of small and medium calibre. The 110½-ton guns have had their difficulties, but it is hoped these have now been overcome.

The Sanspareil gun.

The gun which was taken out of the Sanspareil after its firing trial on December 22nd last was subjected to further trial in the Arsenal at Woolwich. The gun is one of two made for the single turret which exists in H.M.S. Sanspareil. It resembles generally the other 110½-ton breech-loading guns made for England at Elswick, the construction of which is shown in Pl. X., Figs. 17 and 18, which were furnished from Elswick. Its construction differs from the 100 and 105-ton breech-loading guns made for Italy chiefly in the length being greater, in the fact that the inner tube extends in the

* *List of Authorities.—Report on the Exhibits of the Paris Exhibition*, by Lieut.-Col. O'Callaghan, R.A., and Major G. S. Clarke, R.E.; the *Engineer* and *Engineering*, figures and matter; the *Times*; *Proceedings of British Association*; *Report of the U.S. Bureau of Ordnance*, as well as direct communication with manufacturers.

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16·25 INCH 110½ TON B L ARMSTRONG GUN PART A. (MARK I.)
FOR GUNS Nos 6 AND 7 CYLINDER 36' REPLACES S HOOPS 3G, 3H, 3I, 3J, 3K.

ELSWICK 110½ TON GUN.

for H.M.S. Victoria.

Fig. 17.

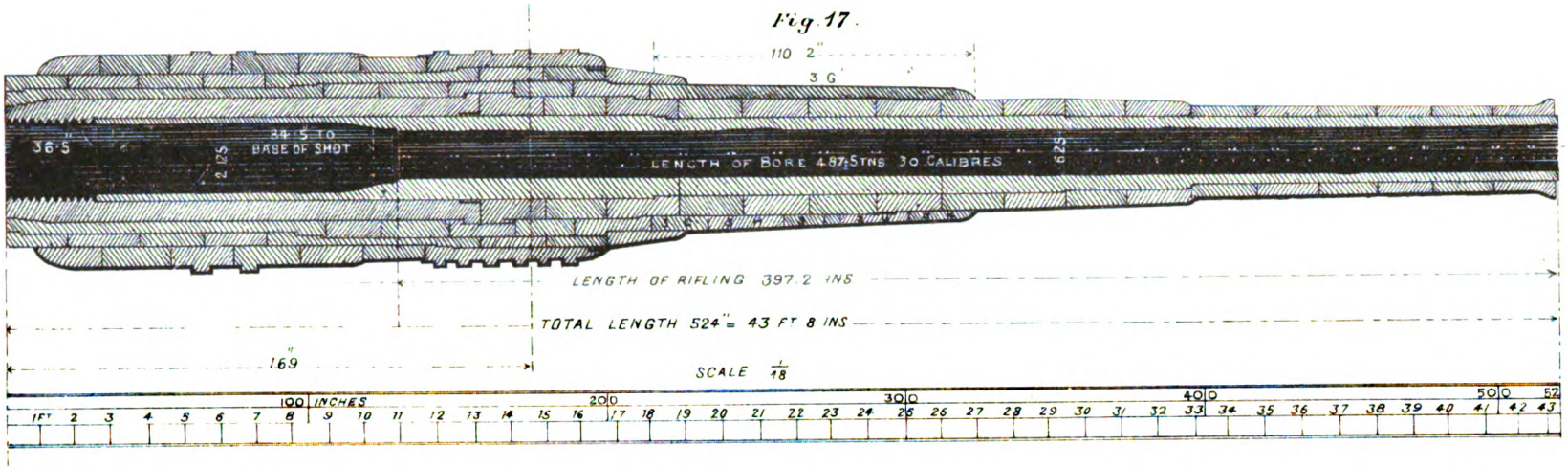
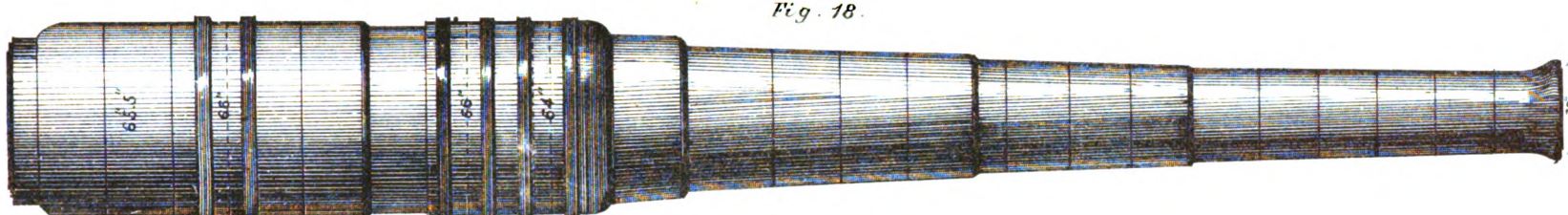


Fig. 18.



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form of a single piece of steel from end to end, instead of being in two lengths, and, as a consequence of this, in the fact that longitudinal strength being thus increased, it was judged advisable to put on the hoops over it for transverse strength in shorter lengths than in the Italian guns. The guns first made for the Benbow and Victoria had the section shown in the lower half of Fig. 17. One Victoria gun was found to droop slightly after proof, owing to the fact that the short cylinders or hoops did not press tightly against each other, so that the great length and weight of the gun tube had the effect of pressing them tightly together on the under side of the tube, beneath the bore, and of opening them slightly on the upper side. To remedy this a comparatively long hoop, shown in the upper side of the section Fig. 17, marked 3 G^1, was substituted for the short hoops 3 G, 3 H, 3 I, 3 J and 3 K. This presumably answered the desired end; but, as stated in the *Naval Annual* for 1890, it was proposed to add another long hoop in front of 3 G^1 in future guns. This was done in the guns made for H.M.S. Sanspareil. Consequently, the section in Fig. 17 in its lower half represents the guns of the Benbow. The upper half resembles the gun as altered for the Victoria, while the Sanspareil gun differs from it in having an additional hoop added in front of 3 G^1. The total weight of the gun is marked on the muzzle as 247,795 lb., that is, 110 tons 12 cwt. 1 qr. 23 lb., or but little over 110½ tons after all changes, implying a slight lightening of other parts to compensate for the new hoop. In the firing trials on board H.M.S. Sanspareil, this new hoop split. Captain Lloyd, R.N., who represented Elswick, pointed out that the gun still corresponded to the Victoria guns, and begged that the firing might be continued; but it was decided to send the gun to the Arsenal for examination, and there a new tube was put on to replace the split one. The gun is stated to have since fired six rounds with charges of 960 lb. of powder, which is the maximum charge used on service. It was then found that the muzzle of the gun drooped, and bent slightly to the right, and the tubes had, near the muzzle, very slightly moved apart, so that in places it was possible to insert the edge of a penknife between them.

This gun was rejected and another supplied instead, which was tested in the latter part of April last and found completely satisfactory.

It has been suggested to arrange with the makers to fire this gun just as it would be fired on service, for a large number of rounds, perhaps for its whole seventy-five rounds, in order to learn what happens. The gain in proving this gun to destruction would be that

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much experience would be obtained at once, instead of some years hence, and this is a matter of great importance.

The Benbow, of 10,600 tons displacement, carries as her primary armament two 110½-ton guns, each in a barbette tower. The Sanspareil and the Victoria, each of 10,470 tons displacement, carry two 110½-ton guns in a single turret, as well as a 10-in. breech-loading gun of 29 tons astern. Each of these ships then depend for their primary heavy power of attack, almost wholly on their two 110½-ton guns. Suppose it ever turns out that the estimate of seventy-five rounds per gun minus the number already fired cannot be reckoned on, will anyone be satisfied to send ships into action that can only fire perhaps twenty rounds per gun—that is, forty rounds in all? Yet this may easily be the case after a few years, so far as concerns the principal armament, and the only guns behind armour in all these three vessels. What is the alternative? The substitution of 67-ton guns for those of 110½ tons; but, gun for gun, this means the substitution of a piece with an energy of only 35,560 foot-tons, instead of one of 57,580 foot-tons; that is, a loss of over 40 per cent. of energy. Doubtless more ammunition could be carried; but, under the circumstances, this would by no means come to the same thing. We ought to be able to carry more of the lighter guns; but great structural alterations and expense would be involved in such a change. The question, then, is so important and so urgent as to deserve immediate settlement, at some sacrifice. Hence the desirability of testing a costly gun to destruction.

Now comes the question, How do they arrange these things abroad? Is this one of the things that they manage so much better in France? In the *Annual* of 1890, p. 368, it was mentioned that a writer in *La Marine Française*, after running through the principal classes of armoured ships, seemed to regard the whole of them as in so poor a way as to require new armaments, and to have actually had them substituted, all the most powerful guns having been found bad on the close examination instituted after the Duperré fatal accident. Naturally we turn to Germany. Krupp only has made guns to rival those turned out at Elswick in power, and we are struck by the fact that we have not heard complaints from Germany. This, however, may be from two causes, either from faultless guns or uncomplaining officers. Probably, had there been a fatal accident, we should have have heard of it. Short of this, perhaps, we should hear nothing, because the silence is not confined to guns but to all the German war *matériel*. In France many things are kept in strict confidence, but at the same time there exist people in France who

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wish to bring faults to light. Questions are asked in the Chamber, and in papers very outspoken articles appear. In Germany, on the other hand, who has ever complained of faults in design in ships, torpedo-boats, of carriages, powder, small-arm rifles, or guns? Silence proves little in Germany, and we are consequently driven to judge from facts that come out. Krupp certainly supplies guns to many Powers, and most excellent guns; but most of these are of comparatively small calibre, and we have for some time had little trouble with such pieces. Nevertheless, there remain the notable four 119-tons supplied to Italy for the defence of Spezzia. It is stated that a muzzle energy on one occasion at Meppen has been achieved of 57,950 foot-tons, which is a little over the 57,630 foot-tons achieved by the 110½-tons Elswick gun, though the work per ton of gun is only 488 against 519 foot-tons, so that the Elswick has attained a higher standard for its weight. The pressures are reported as 19·5 and 19·9 tons respectively. The actual maximum attained by a single round, however, is not what concerns us, but the service behaviour of the piece. At Spezzia a moderate charge only is used, viz., 300 kilos. (661 lb.), and a projectile of 920 kilos. (2240 lb.), with a muzzle velocity of 1821 ft. and energy of 46,630 foot-tons. It is stated that a gun at Meppen has fired eighty-two rounds without suffering, but it is not said with what charges. The energy allowed at Spezzia is much less than is expected from our 110½-ton guns, namely, 57,580 foot-tons.

It may be urged on behalf of Elswick that no Power has anything approaching to a 100-ton gun afloat, except those supplied from Elswick. The Italian Government have as many as twenty-eight afloat, viz., the Duilio and Dandolo, with eight 100-ton muzzle-loading guns of much less power than the breech-loading pieces; the Italia and Lepanto with eight 100-ton breech-loading guns, and the Lauria, Doria, and Morosini having together twelve 105-ton breech-loading guns. One of the early 100-ton guns of the Dandolo forced its breech out, bursting, but without serious injury to anyone. Since then we have heard of no difficulties. As concerns England, it may be seen that Elswick is attempting work scarcely undertaken by other makers. For this reason we ought to satisfy ourselves that such a piece as the 110½-ton gun has *a useful life in front of it when issued both as to safety, length of service and accuracy.* If Krupp can afford to fire eighty-two rounds from a gun representing a very small number, surely we can afford to test thoroughly this and other guns playing important parts in our armaments.

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Canet and other French Ordnance.

Plate XI.* shows the system of construction of various guns. It may be observed that in each of the three French pieces, Canet, de Bange, and the naval type, much more work is thrown on the inner tube than in the Krupp or English guns. Not only is the tube much thicker, but also it is carried right through to the breech end of the gun; the breech block engaging in it thus, it bears all the longitudinal as well as a large part of the transverse strain. Krupp has a very thick jacket on his breech. The English gun is built up of rings of nearly even thickness, and ought to be the safest against bursting, seeing that it would be less affected by a flaw in any one layer of steel. Canet has carried the new type principle to the fullest extent as to length. It is claimed that his construction is simpler; but there ought to be less difficulty in ensuring soundness in all the parts of our guns than in the French or German constructions.

The 15-cm. (5·9-in.) gun on centre-pivoting carriage.

The mounting for the central-pivoted carriages with hydraulic brake for 15-cm guns consists of four principal parts as follows: the carriage properly so called; the under-frame; the base-plate; the shield (Pl. XII.).

This mounting in many features closely resembles the Vavasseur structures. M. Canet formerly worked with Vavasseur, and comparatively little has been added to the designs then invented.

The carriage is constructed of two hydraulic brake cylinders, the lower sides of which are formed with slides which bear upon, and are clipped to, the corresponding slides of the under-frame. At the upper side of these cylinders are two projections that receive the trunnions of the gun. On the left-hand side of this carriage are placed the various parts which compose the apparatus for elevating the gun. The under-frame consists of two vertical side frames and a platform. The upper sides of the frame are formed into slides on which bear the under parts of the upper carriage; in front of the under carriage are projections to which are attached the ends of the piston-rod which work in the hydraulic brake cylinders. On the right-hand side of this under carriage is secured the mechanism for horizontal training; on the left-hand side is fixed a hand pump and small tank for bringing the gun back out of firing position, worked by a lever. In the centre of the platform is a socket to receive the pivot which projects from the middle of the base-plate. Two steel clips are fixed to the front part of the platform and resist the overturning effort made by the gun when it is fired. The base-plate,

* This plate and the following are taken from *Engineering*, which last year devoted a large portion of many of its numbers to the Canet Ordnance.

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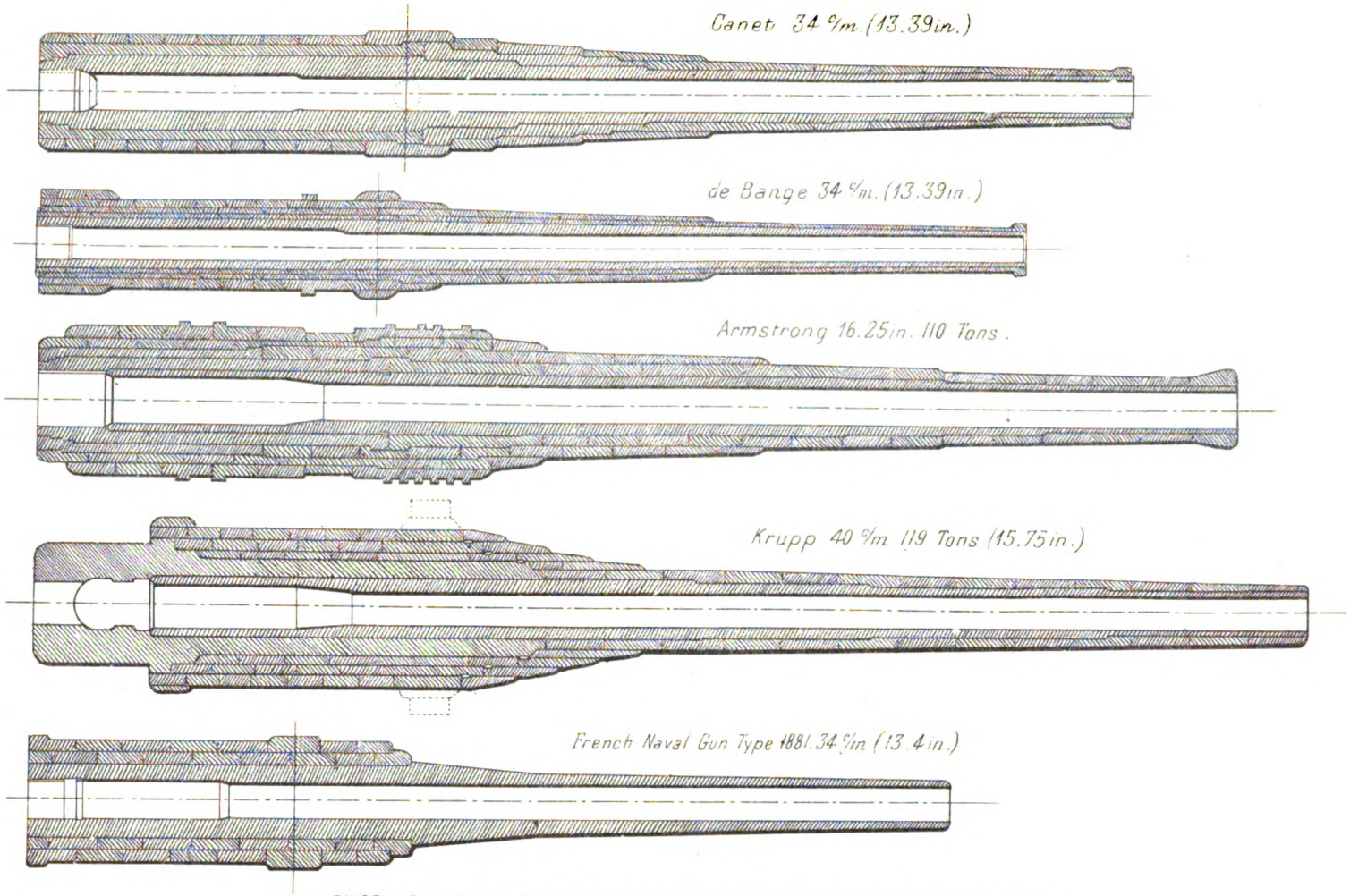
Canet 34 %m (13.39in.)
de Bange 34 %m. (13.39in.)
Armstrong 16.25in. 110 Tons.
Krupp 40 %m 119 Tons (15.75in.)
French Naval Gun Type 1881. 34 %in (13.4in.)

DIAGRAMS SHOWING CONSTRUCTION OF VARIOUS STANDARD TYPES OF GUNS.

Pl. XI.

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15 CENT. (5·90-in.) GUN ON CENTRE PIVOTING CARRIAGE CANET SYSTEM.
CONSTRUCTED BY THE FORGES ET CHANTIERS DE LA MEDITERRANÉE HAVRE.

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which is bolted to the deck of the ship, supports the under-frame by means of a roller ring, the wheels of which are kept in their proper positions by inner and outer rings that are recessed at equal distances to receive the axes of the rollers. A pivot guides with accuracy the moving part of the carriage while the gun is being trained for direction, and prevents any horizontal displacement during fire. On the outside of the base-plate is a projecting ring, under which the steel clips fastened to the platform take their bearing. The hydraulic brake is on the Canet system, with a central counter-rod. It is formed of two cylinders, cast with the upper carriage, the pistons in which are attached to the rods, the ends of the latter being bolted to the projections at the top of the under-frame already mentioned. The piston-rods are hollow, and in the spaces thus provided the counter-rods can enter; the ends of the latter are bolted to the bottom of the hydraulic cylinders. During recoil the movement of the gun is transmitted to the carriage, and the liquid is compressed between the front face of the pistons and the forward end of the cylinders; then it passes to the rear of the pistons through the annular space left clear between the central rod and the slight openings made in the middle of the piston. The liquid, in order to pass through these openings, lifts the valve, which is held down in place by a spring, and which falls back again, closing the orifice as soon as the recoil is terminated.

This valve serves to regulate the return of the gun to firing position and to prevent this movement from being too rapid. At the end of the recoil, when the valve has been forced back upon its seat, the liquid cannot pass from the rear to the front of the piston except by flowing through some very narrow passages, and, as a consequence, the gun rises back into firing position at a slow and easily controlled rate. The orifices for the passage of the fluid during recoil are regulated by the central counter-rod, the diameter of which varies at each instant with the travel of the piston, in order that it may follow step by step the variations in the effort of recoil, and maintain a constant pressure within the brake cylinders. An absolutely regular action of the brake mechanism is thus maintained. Bringing the gun down out of firing position when the agency of the recoil is not available, is effected by means of the hand-pump mounted on the left-hand side of the frame; this pump forces the liquid into the hollow piston-rod of the brake cylinder. The water under pressure acts on the bottom of the cylinder and forces the carriage to shift into the desired place on the under-frame; all that is then necessary is to close the valve, which shuts off communication between the pump and the liquid,

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when the carriage is held in any desired position. Vertical training is effected by means of a hand-wheel working—through the Canet differential gear—a pinion gearing into a toothed sector bolted to the left-hand side of the gun. This hand-wheel is mounted on a spindle perpendicular to the side of the under-frame; it is keyed on an eccentric sleeve, and a toothed pinion, fast on this eccentric, gears into a sleeve with internal teeth that give motion to the working spindle.

Elswick howitzer for high-angle fire.

The value of high-angle fire against ships' decks has been recognised for many years in different countries. We have adopted it for the defence of coaling stations in a measure. Italy, however, appears to have reduced it to a system to an extent which probably distances other powers. Pl. XIII. shows an 11-in. howitzer mounted on an Elswick carriage, taken from a photograph of a new design. This piece is fired at varying elevations, from 7 deg. depression up to about 45 deg. elevation. A previous pattern ranged from 45 deg. to 70 deg. elevation. The shield shown is fixed to the carriage and recoils with it. The gun is shown at nearly the maximum elevation, and is nearly close up to the top of the aperture of the shield A A, though when the gun is horizontal the position of the shield is such that the aperture is still nearly closed. In recoil the gun and carriage move in the direction of the surface of the platform or slide. There are two front and two rear rollers which come into play, owing to the pull of the spring in the box G and the tilting bar H, which lift up the rear end of the carriage when it runs forward; but during recoil the gun's recoil strain overcomes the tilting power, and the carriage slides on the plane surface of the platform. The recoil resistance is provided by means of a pair of hydraulic presses under the carriage, between the two beams of the slide, and parallel to their surface. The hand-wheel B at the forward end of the carriage is for elevation, and the crank at the rear of the platform is for training.

The chief particulars relating to the gun and ammunition are as follows:—

Weight of projectile	478 lb.
Weight of gun charge	44 „
Bursting charges { Penetrating shell	21 „
Bursting charges { Common shell	64 „
Rifling	64 grooves.
System of breech	Parallel interrupted screw and cup gas check.
Weight of gun	11 tons.

The carriages are very easily worked. Four men, or even three, can do the training, elevating, and sighting; while the loading in

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HIGH ANGLE BREECH-LOADING HOWITZER.

Made at Elswick, for coast defence.

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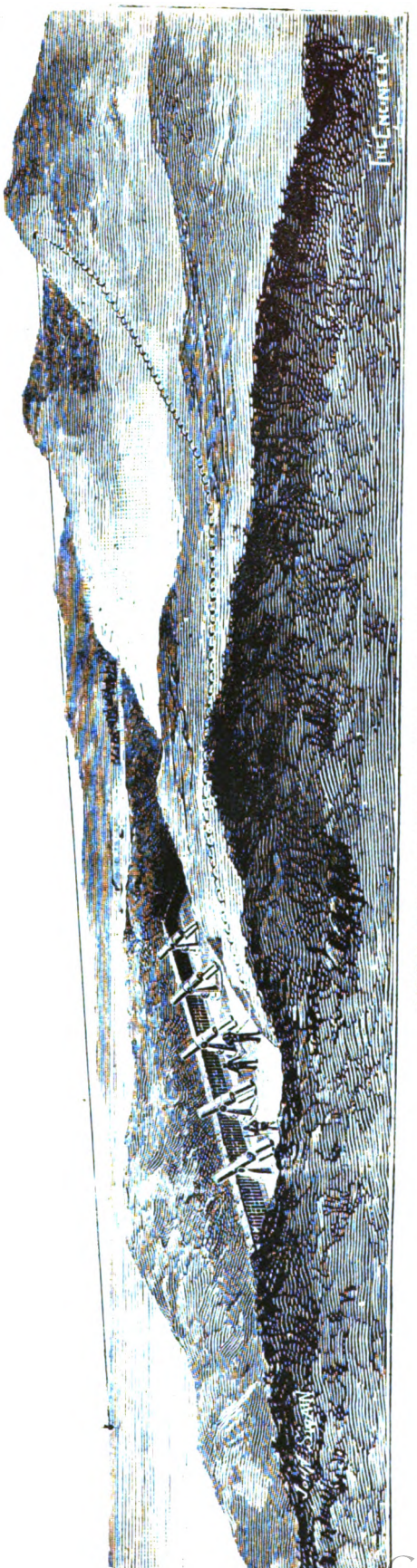

HIGH ANGLE HOWITZER BATTERY.

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either design requires about four men. About seventy of these high-angle carriages, taking the two designs together, have been supplied.

The work of training is extremely small, a force of only about 8 lb. or 10 lb. being required for each ton of weight moved. Thus, in the present case the revolving weight of the howitzer and carriage is about 20 tons, and the horizontal force required to produce motion is 180 lb. if applied at the radius of the roller path; or 12 lb. if applied on the rim of the training hand-wheel. The power required on the hand-wheel to elevate or depress is about 8 lb.

The drawing, Pl. XIV., shows the arrangement of a battery of howitzers for attack of ships' decks by high-angle fire. It will be seen that the pieces themselves, mounted behind a high parapet on ground of considerable command, are not open to direct attack from ships, and practically they are not open to attack at all from them. It is presumed that in such a case no shield would be fixed on the carriage. They are enabled to fire accurately by means of directions given them by the telephone connection, marked in the engraving, with the observing station far to the right.

Very successful experiments have been carried out at Spezzia, with vertical fire against moving objects. We have in England made experiments with vertical fire. Major Watkin has confidence in good results being obtained with vertical fire against moving targets on his system. Under the most perfect direction, however, the time of flight of the projectile must enable the wind to act on it, which, with the movement of the ship, constitute peculiar difficulties. Against vessels at anchor vertical attack is very formidable. Undoubtedly it would not be reasonable to expect a projectile of any kind to pass right through the ship and out at her bottom, because even an armour-piercing projectile, if it had falling velocity enough for such an effect, would probably be broken up long before it reaches the bottom. Shells at high angles seldom fall truly points first. Now, a shell striking truly point first at an angle to an object is much more likely to break than in a direct blow; but if the shell's axis is also at an angle to its path, fracture is much more easily effected, and in many cases this would probably take place in passing through an upper structure before the armoured deck is reached. The effect produced, then, by any description of projectile would be the fracture and disorder caused in the complicated machinery with which modern ships are now fitted. It would be a serious, but not a fatal, injury.

It having been decided to replace the old guns in the Thunderer, Devastation, and Rupert by those of a new type, Elswick obtained

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Mountings for new armaments of H.M.S. Thunderer, Devastation, and Rupert.

the order to replace the two 38-ton and two 35-ton muzzle-loading guns in the first-named ship, the Thunderer, by four 10-in. 29-ton guns. Sir J. Whitworth and Co. have undertaken the work of replacing the four 35-ton guns of the Devastation by four 10-in. 29-ton guns, and Messrs. Easton and Anderson are replacing the two 10-in. 18-ton muzzle-loading guns by two 9·2-in. 22-ton guns. With the permission of the Admiralty descriptions of the mountings have been obtained from the respective makers. The leading principle laid down is that all these guns are to be worked by hand, not by hydraulic gear. It will be seen that while the mountings in the Thunderer and Devastation are fairly comparable, that of the Rupert is altogether different. In the case of the two first-mentioned guns, there is hardly any preponderance, and the main work in elevation is the overcoming of friction, which has been ingeniously and successfully accomplished. In the Rupert guns a heavy lift is necessary, and the work of elevation is rather a cramped piece of work to undertake.

Each firm had considerable latitude in the course pursued, such designs as they judged best suited to meet the case being adopted.

Elswick gun-mounting.

Pls. XV. and XVI. show the general plan of the Elswick mounting. In the Thunderer, the exchange of the old muzzle-loading guns for the new type breech-loading guns is reported as effecting a saving in weight of about 100 tons in all, while the increase in energy of fire is considerable. The muzzle energies of the 38-ton and 35-ton guns are respectively 13,930 and 9469 foot-tons; while that of the new 29-ton gun is 15,290 foot-tons, implying a gain of 14,362 foot-tons on the four guns. There are certain special points of interest to note in the new Elswick mounting adopted.

In the first place, the provision for working the guns by hand-power deserves special notice, the more because it is the heaviest piece so worked. As the gun is almost without preponderance, being nearly balanced on its trunnions, the principal work in elevation is that necessary to overcome friction; any decrease of friction, then, is a decrease of the fundamental work to be performed. An ingenious device, termed an anti-friction pivot, has been brought out at Elswick. It consists of a pivot screwed into the end of each trunnion, being continued on the same axis as the trunnion, like a small trunnion standing out from the centre of the ordinary one. This has a knife edge on the under side. A strong, heavy spring is fixed on the carriage beneath this anti-friction pivot. It is hinged at one end, and supported by a screw at the opposite end. This screw is turned so as to press the anti-friction pivot knife edge until the main part

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ELSWICK MOUNTING FOR 29-TON GUNS, OF H.M.S. THUNDERER.

Fig. 19.

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ELSWICK. MOUNTING FOR 29-TON GUNS, OF H.M.S. THUNDERER.

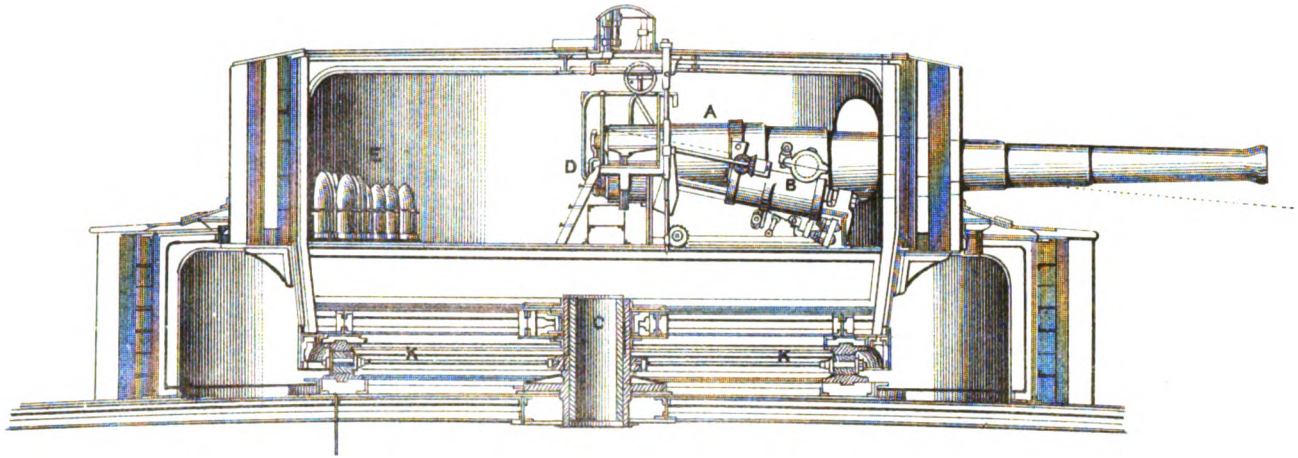

Fig 20

Pl. XVI.

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Whitworth's Recoil Brake & Running up Gear.
Applied to H.M.S Devastation.

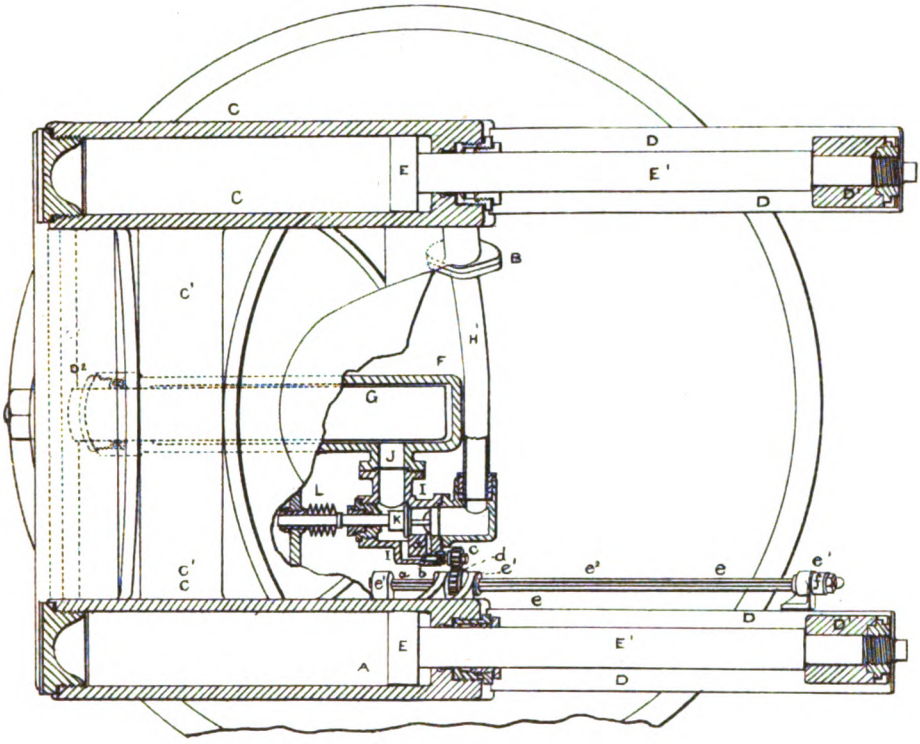

Fig. 21.

Whitworth-Mounting.
for Turret-Guns of H.M.S Devastation.

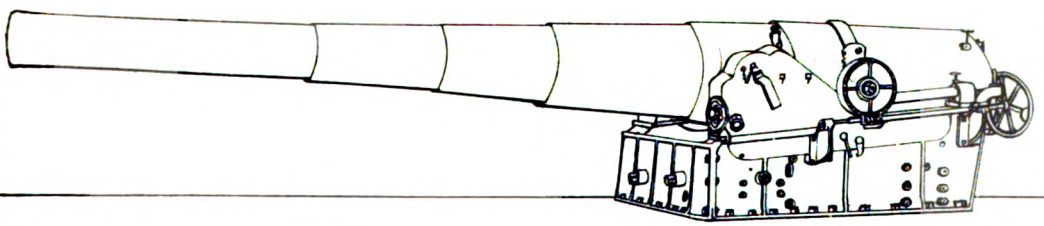

Fig 22

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of the weight of the gun is supported by the strong spring during ordinary working. On firing, however, the spring yields sufficiently to let the trunnion impart its blow into the ordinary bearing instead of the spring. By this means, while friction is reduced to a very small amount, it is found that the spring is saved from the blow which it might be expected to receive on firing, by the yielding of the spring, and does not show any signs of injury after firing. There is also a new form of controlling-ram to bring the running out of the piece well in hand. This is very like the designs of Vavasseur before he joined Elswick, the movement being regulated by a control rod which enters a hollow piston in the press as the gun runs up, and is tapered so as to adjust the escape of the oil and running up of the gun to a nicety. The guns have three sighting stations, H, H and F, shown in the plan, Pl. XV. The general arrangement of the mounting is shown in Pls. XV. and XVI. The ammunition is shown at E, the anti-friction pivots and springs are at B, and the breech-closing gear at D, D.

The 10-in. turret mounting for H.M.S. Devastation, designed and made by Sir Joseph Whitworth and Co., is shown in Pl. XVII., Fig. 21, with the gun mounted, and the parts are seen more fully in Fig. 22.

Whitworth gun mounting.

The angle of the slide is 5°, and the rollers make an equivalent to a slide angle of 9°. The frame brake and compensation cylinders are of cast steel. The mountings are right and left hand indifferently. A is the base-plate or racer; B the turn-table or under-carriage; C, C are the brake-cylinders, which are united by a transom C^1 and form therewith the cradle or top-carriage of the gun-mounting. This cradle or top-carriage is formed with bearings C^2, in which the gun is mounted by means of its trunnions, and the said cradle or carriage is arranged to move longitudinally upon slides, D on the under-carriage, B of the said gun-mounting. E, E are the pistons of the hydraulic brakes, the rods E^1 of which are firmly fixed in brackets or bosses D^1 at the rear ends of the slides D. F is the cylinder of the compensating device, which is formed on, or firmly attached to, the top-carriage. This cylinder is provided with a ram or plunger G, which is firmly secured at D^2 in a transom at the forward end of the chassis-frame or under-carriage B.

Pipes H, H^1 are provided for communication between the brake-cylinders C and the compensating cylinder F. These pipes connect the cylinders C with a valve-box I, which is connected by a short pipe J with the compensating cylinder F. The valve-box I contains a valve K loaded by a spring L. A small bye-pass or branch-passage α is formed in the valve-box I, and is provided with a

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regulating-valve *b*. The stem of this valve has fixed thereon a pinion *c* which is geared with a pinion *d* upon a shaft *e* carried in bearings e^1 formed with, or attached to, the chassis or under-carriage B, and extending through bearings e^2 formed or fixed on the cradle or top-carriage.

The pinion *d* is secured upon the shaft *e* by means of a key fitted to slide in a long key-way e^3 in the said shaft, so that, although the said pinion must rotate with the shaft, it is free to slide longitudinally thereon in the to-and-fro movement of the gun upon the slides D. Therefore, whatever may be the position of the gun on the said slides, the valve can be controlled by turning the shaft *e*, which is provided, for this purpose, with a lever *f*. By these means, the said valve can be adjusted while the gun is moving upon its slides. Other suitable means may, if desired, be provided for effecting the adjustment of the said valve whatever may be the position of the gun on its slides. For instance, an arm may be keyed upon the shaft *e* and connected by a link with an arm or lever on the valve-stem. The cylinders C, F and the pipes and passages connecting the same are filled with liquid. By and during the recoil, the liquid in the brake-cylinders C, in front of the pistons E, is forced to the rear of the latter, as in other well-known hydraulic recoil-brakes, and a volume of liquid is displaced from the said cylinders by reason of the progressive immersion of the piston-rods E^1. The liquid thus displaced is forced through the pipes H, H^1, and, lifting the valve K, passes through the pipe J into the compensating-cylinder F. The transverse sectional area of the ram or plunger G is equal to that of the two piston-rods E^1 of the recoil-brakes.

Therefore, during the recoil, the volume of liquid which, as above described, passes from the brake-cylinders C into the compensating-cylinder F will completely fill the void produced in the latter by its rearward movement, because the said cylinder will have been, by such rearward movement, displaced relatively to the ram or plunger G through a distance equal to that through which the brake-cylinders are displaced relatively to their pistons. The brake-cylinders and the compensating-cylinder are, therefore, always full of liquid whatever may be the position of the gun and top-carriage on the slides D.

At the termination of the recoil, the valve K closes under the action of its spring L (the strength of which is suitably calculated), and interrupts the communication between the brake-cylinders and compensating-cylinder, whatever may be the position of the gun and top-carriage, when they come to rest upon the slides D. The

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"Naval Annual" 1891.

ERRATA.

On Page 309, line 19:—for Plate XVII, Fig. 21, read Plate XVIII., and in line 20:—for Fig. 22 read Plate XVII.

On Page 311, line 26:—for Plates XVIII. and XIX. read Plate XIX.

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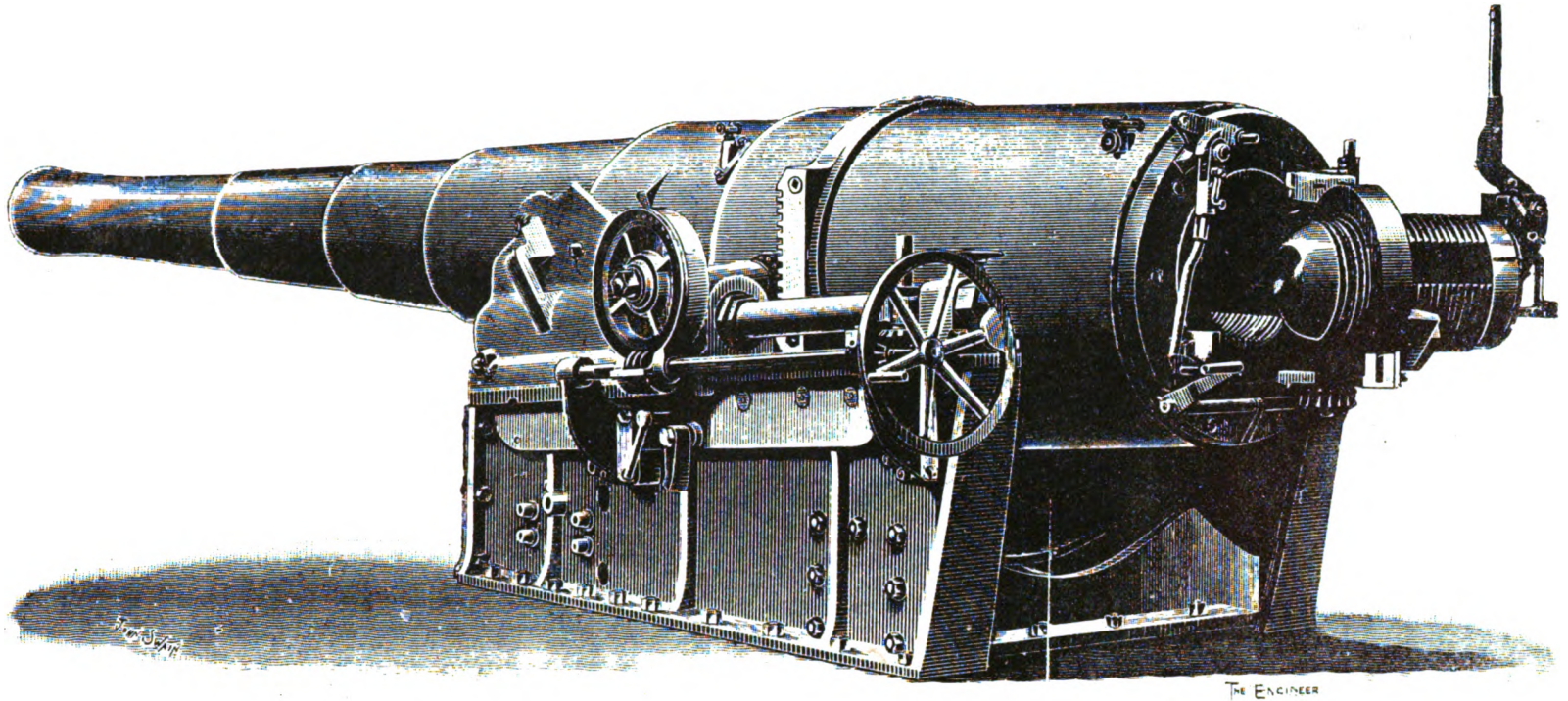
WHITWORTH'S MOUNTING FOR H.M.S. DEVASTATION.



Pl. XVIII.

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EASTON & ANDERSONS MOUNTING FOR H.M.S RUPERT.

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liquid in the compensating-cylinder, being retained therein, will then prevent displacement of the said cylinder, consequently the gun and top-carraige will be held in their recoiled position and cannot run out or return to the firing position until communication is established between the brake-cylinders C and the compensating-cylinder F by opening the valve *b*. When this value is opened, liquid can flow from the compensating-cylinder into the brake-cylinders through the bye-pass *a*, and the gun and top-carriage will, therefore, return to the firing position under the action of gravity; the speed of this return movement can be regulated or controlled at will by the adjustment of the valve *b*, so that no shock or jar will be imparted to the gun-mounting at the termination of the return movement.

To ensure the run out when the ship is heeled, so that the slide is almost horizontal, two springs are fitted on the inside of the frames which push the gun out or assist the run out due to gravity. The sighting is automatic by gearing with the gun through an arc on the elevating band, which arc can be used as an elevating arc or sighting-gear arc, according as the gun is in the left or right-hand position. The angles of elevation are + 13 and − 5. There are three elevating stations, one centre and two side stations, each controlling its own gun and sights, and each gun can also be elevated, but not sighted, from the platform. The gear for controlling the training engines of the turret is worked from any of the three stations. A supply of projectiles is carried in the turrets behind the gun.

Easton and Anderson's muzzle-pivoting mounting.

The gun mountings of H.M.S. Rupert, Pls. XVIII. and XIX., are constructed to mount two 9·2-in. breech-loading guns in the existing turret of the ship, with as little alteration as possible. They are made on Anderson's storage recoil principle, by which the work of recoil is absorbed for the most part by means of a hydraulic buffer, but also a certain proportion by means of springs, which, by their reaction, serve to run the gun out again, either automatically or by opening a valve when desired. The mounting consists of two cast-steel side frames, pivoted at their front end in wrought steel frames built up in the turret, and joined together by transoms underneath, which serve as supports for the spring cylinders also. The frames have slides on the inside, on which run two cast-steel recoil cylinders, having bearings formed on them at their front ends for the trunnions of the guns, and provided with bands, clipping the gun near the breech, so that it is firmly fixed to the two recoil cylinders. At the rear end of the frames are strong hollow cast-steel brackets, carrying each a hollow plunger, parallel with the frame, and passing through

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a gland into the recoil cylinder, so that, when recoil takes place, the liquid in the cylinder is forced out through the hollow plunger.

To absorb the greater part of the energy of recoil, a Bull's metal spike is fixed in the front end of the cylinder, and projects into the hollow ram, the shape being such that the resistance to the liquid in passing out maintains a constant pressure in the cylinder, opposing the reaction of the gun. The liquid, after passing through the hollow plunger and bracket, is conducted by short pipes to two recoil valves arranged on the sides of two short cast-steel cylinders bolted together, side by side, and fixed to the side frames. These are called the storage cylinders, and have each a loose piston working in it, pressed upon by a column of disc springs, which are supported by means of tubes riveted on to the forward ends of the cylinders. When the liquid is forced in past the recoil valve, the piston is moved forward, compressing the springs further, and, on opening a passage between the storage cylinder and the recoil plunger, the springs react, force the liquid back again, and run the gun out. The running-out valve which accomplishes this may be left open, if desired, and then the gun will run out at once after firing.

To check the gun when running out and bring it quietly against the buffers, a throttling arrangement is provided on the cylinder by an enlarged end screwed on the ram, which, near the end of the stroke, fits the cylinder pretty closely, though free for the rest of it. A portion of liquid is thus imprisoned near the end of the stroke, and can only escape through the windage between the ram head and cylinder, so that in the course of an inch or two the velocity may be quite checked.

The elevation and depression of the gun is effected by means of hydraulic presses secured to the framing, one under each side frame. They have trunk plungers and connecting rods attached to bearings on the side frame. The hydraulic supply for these presses is obtained from a duplex hydraulic pumping engine, or continuous accumulator, placed in the ship near the turret, and connected by means of swivel pipes on the pivot with the hydraulic regulating valves in the turret, the exhaust liquid being returned to a tank under the pump in a similar manner. A duplicate pump and tank is provided as a stand-by. A connection is provided by means of jointed pipes, so that the recoil storage cylinder of the mounting can be readily emptied and re-filled by the hydraulic pump. The elevating valves are worked from three sighting platforms, one on each side and one central, the latter being arranged so that both guns can be worked from it.

The sighting gear is Anderson's patent arrangement, and consists,

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primarily, of a bar pivoted to the turret roof at the forward end, and connected by means of a rod with the mounting at the other; by which means it is caused to oscillate parallel to the axis of the gun when it is being elevated or depressed. The sights themselves are specially designed for the arrangement to meet certain stipulated requirements; and they are fitted into sockets at the ends of the oscillating bars 5 ft. apart. Each mounting has two sets of sights, one on each side, so that the central sighting station has command of one set belonging to each mounting, and the outer stations have only the sights belonging to the mounting on their respective sides.

A Graydon Dynamite Gun has been recently manufactured by Messrs. Taunton, Delmard Lane & Co., of Birmingham, and is shortly to be tried. This gun is simply a pneumatic gun for discharging the large shells proposed by Graydon containing high explosive (see *Naval Annual*, 1888–89, p. 383). It consists of a tube or barrel of Whitworth forged steel, 30 ft. in length, and weighing 11 tons, having a 15-in. bore. It is supported at the breech end on trunnions 15 in. in diameter, which are made hollow for the passage of compressed air into the gun. Towards the muzzle it is carried on movable trunnions, which engage with two steel arms or levers having sliding fulcra and extracted by a hydraulic plunger for elevating or depressing the gun. The breech-piece is a screw-block with interrupted screw-threads. The carriage, which is of steel, runs on conical rollers on a circular roller-path 21 ft. in diameter. It is moved by a Heenan and Froude spherical quick-speed engine. By these means all-round fire is obtained, and any degree of elevation can be given. The projectile is 6 ft. 3 in. long, and, with a 600-lb. charge of dynamite, weighs 1300 lbs. It has a telescopic tapering tail for retaining direction, the gun being a smooth bore. The power for propulsion is provided by 32 reservoirs 4 ft. high and 10 in. in diameter, containing air compressed to 5000 lb. on the square inch. Any sections of eight cylinders may be employed for the discharge of the gun according to the power required by means of valves and pipes of Whitworth steel. The shell is lined with asbestos cloth, to act both as a cushion and a non-conductor of heat; the charge is subdivided into small pellets of dynamite enclosed in waxed paper, so as to prevent the escape of nitro-glycerine and its accumulation in one place. Sir Frederick Abel, in his address to the British Association (noticed on p. 319), appears to refer to this gun, and, if so, he seems satisfied that safety may be secured against premature explosion. The velocity is said to be 3 miles in 30 seconds, which implies a mean velocity of 528 ft. per second. The resistance

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to such a projectile and its angle of elevation both being very great, the muzzle-velocity must be considerably in excess of what might be at first guessed from these figures. Direction being preserved by the action of the tail on the principle of the old Congreve rocket, and the effect of the air during the long flight and other conditions being borne in mind, the most doubtful element in the question appears to be accuracy. No doubt an enormous bursting charge, acting like a mine, may be formidable even within a comparatively large radius. Experiment will show whether such a measure of accuracy can be secured.

Fiske's range-finder.

Lieutenant Fiske, United States Navy, submitted a range-finder to the examination of our Government officials in December last. He uses the long base line furnished by the deck of a vessel to determine distances. On two American vessels, the Baltimore and the Chicago, Fiske's instruments have been fixed and tried—on the former since last July, and on the latter since last November year. Duplicate instruments are placed on pillar mountings shown in the engravings given herewith, fixed on the deck, 92 yards apart, connected by electric circuit, and fitted with telephones. When the telescopes are parallel the range reads as "infinity," and as they are brought to any angle the range where their axes meet is automatically indicated on an arc marked with ranges on the indicator. These are carried up to 30,000 yards, which is ten times as much as is likely to be wanted for actual firing at sea, but enables the range-finders to be used for determining the distance of headlands or points on shore, which might be valuable in coasting work and in surveying. The actual theory on which the instrument depends is described in the following terms:—

The accompanying diagram—Pl. XX., Fig. 23—illustrates the principle of Lieutenant Fiske's new range-finder. We will suppose A B to be a base line, and T the position of a distant object, the range of which A T is to be determined. By trigonometry, in the triangle A T B,

$$A\,T = \frac{A\,B}{\sin A\,T\,B} \times \sin A\,B\,T.$$

Let C and D represent two telescopes pivoted at the points A and B and sweeping over arcs E and F of conducting material, the arcs having their extremities upon the base line A B. Let the telescope C be directed upon the point T, assuming the position represented by C′, in dotted lines. Then obviously, the angle C′ A C is equal to the angle A T B, and the portion of the arc E, included between the positions C and C′ of the telescope, will measure the angle at A T B.

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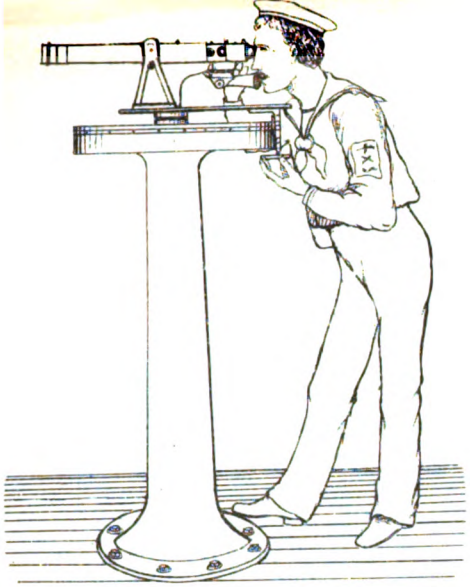
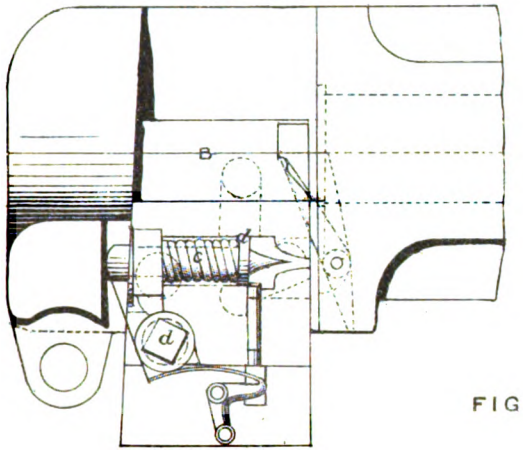


FIG 24- FISKE RANGE FINDER IN USE.

FIG. 26.



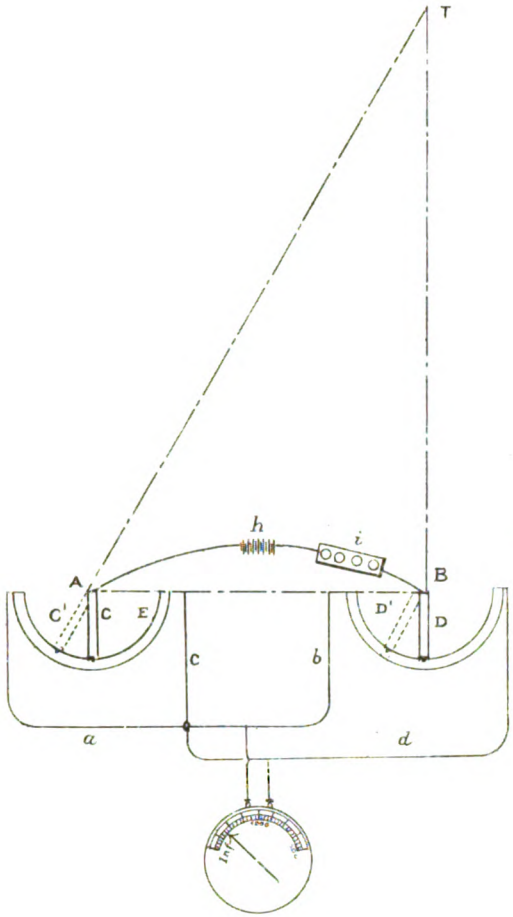


FIG 23.- DIAGRAM OF THE FISKE RANGE FINDER

FIG. 25.

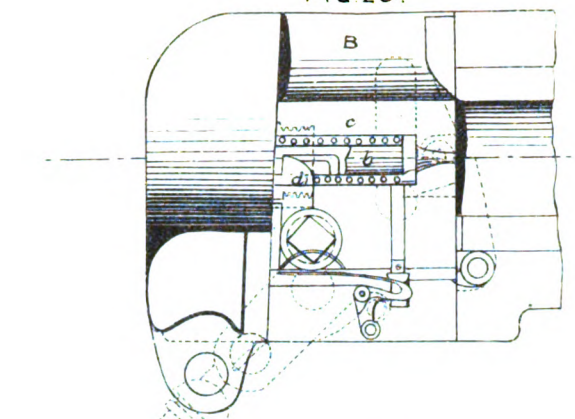
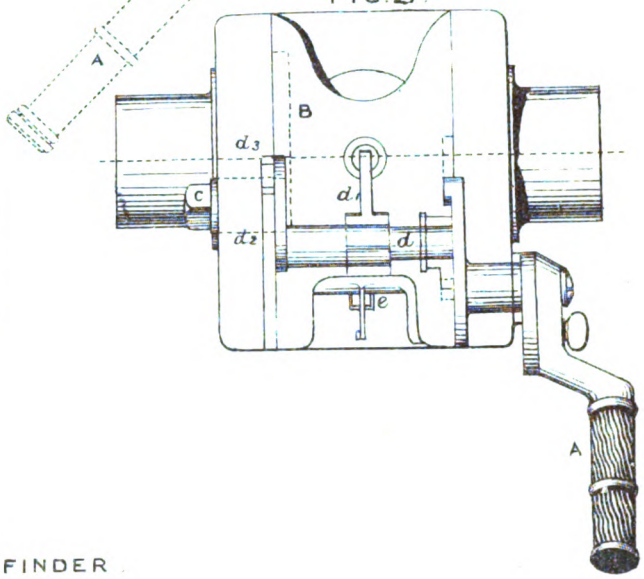


FIG. 27.



PL XX

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In the foregoing formula, the base line A B is known by measurement, and the angle A B T may be observed: and if the angle A B T is, as shown in Fig. 2, a right-angle, then the sin A B T becomes unity. It remains, therefore, to find the angle A T B in order to determine the distance A T; so that it becomes necessary to provide a simple and rapid means of at once determining what the angle A T B is. To this end, the conducting arcs, E, F, are connected in the manner of a Wheatstone bridge, the four members of which are shown respectively at *a*, *b*, *c*, *d*. In this bridge is connected a galvanometer in the usual way, and also the battery *h*; the terminals of the battery wire being connected to the telescopes at their pivot points A, B, so that the circuit proceeds through the telescopes to the arcs, and then at the arc F divides through the wires *b*, *d*, and at the arc E divides through the wires *a*, *c*.

It will be plain that when the two telescopes C and D stand at right angles to the base line, and hence parallel to each other, the bridge will balance, and the galvanometer will show no deflection. The lines of sight of the two telescopes then being parallel, the galvanometer will then indicate infinite range; and of course this will be true, no matter where the telescopes may be on their respective arcs, so long as their lines of sight are relatively parallel. But if one telescope be moved out of parallelism with the other, as, for example, the telescope C moved to the position C′, then, clearly, the bridge will be thrown out of balance, and the galvanometer will be deflected. It will also be clear that the extent of deflection of the galvanometer will depend upon the length of arc included between the two positions of the telescope, C, C′, and will be greater as that arc increases; so that, with a battery of constant electro-motive force, it becomes possible to determine the extent of movement of the telescope C by simply observing the indication of the galvanometer.

It will of course be obvious that as the angle between the positions C and C′ of the telescope increases, the length of the line A T will constantly decrease, while the deflection of the galvanometer will constantly increase; so that the galvanometer indicates ranges starting from infinity when the galvanometer shows no deflection, small ranges being indicated by large deflections of the galvanometer, and *vice versâ*. As a matter of convenience, Lieutenant Fiske employs for this purpose a galvanometer so constructed that the deflections of the index will be proportional to the differences of potential at the terminals.

It will be clear that by the method just described the operation of

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finding the range is reduced to a very easy and rapid process, and at the same time greatly simplified as regards apparatus.

Observers stationed at the two telescopes C and D align them with the distant object, when a third observer instantly reads the range from the galvanometer, which is provided with a scale suitably marked in linear units, such as yards.

Fig. 24, Pl. XX., shows the range-finder as actually used on shipboard. Telephones are so secured to the telescopes that the act of putting the eye to the telescope brings the mouth against the transmitter and the ear against the receiver, so that both observers are continuously in communication with each other.

The telephones have been added in the recent instruments because practical work at target practice at sea showed the value of instantaneous communication between the observers. The observers, now, can instantly change their lines of sight from some point of the target which may be enveloped in smoke to another part that may be clear; they can also take the distance of a number of objects in rapid succession. Furthermore, the observers constantly keep each other advised as to whether or not their telescopes are pointing at the target, and thus guard against the danger of reading the galvanometer at a time when the indication might be incorrect by reason of either telescope being temporarily thrown off the target by a lurch of the ship. This is found a great convenience when the sea is heavy, and it makes the indications of the galvanometer as trustworthy when the ship is rolling in a heavy sea as when she is at anchor in smooth water, though the accuracy in a rough sea is less.

The instruments are made of aluminium bronze and iron, and are left exposed on deck without any protection whatever, except that a cover is placed over the telescope when not in use. The instruments require no care except an occasional cleaning. Fiske's range-finder has already been tried and approved of by the French and Italian Navies, and a most favourable official report has been also made in the United States. It is much to be desired that we should hasten the trial in this country.

Official report of progress in United States Navy.

The Report of the chief of the Bureau of Ordnance to the Secretary of the Navy of the United States, for 1890, contains accounts of the progress made in the manufacture of guns and projectiles, and other material during the year. The new-type guns appear to fulfil well the promise originally made, coming well up to the figures given in this *Annual* in past years, which were originally only estimates. 8 and 6-in. guns of 35 calibres have given 2100 ft. velocity, with 15 tons pressure, the

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former with a 250-lb. projectile; a powerful 6-in. gun of 40 calibres long has been ordered. A 4-inch gun of 40 calibres length has discharged a 36-lb. projectile with 14-lb. charge at a velocity of about 2000 ft., with a pressure of about 14 tons. Quick-firing guns of this calibre and of 5 inches have been commenced. The latter has been considered about the limit for a quick-firing gun, because the fixed ammunition for the 6-in. gun is considered too heavy; that for the 5-in. gun weighs below 100 lbs., which is found to be a manageable weight.

On board the Monterey* a 16-in. gun is being replaced by two 12-in. guns, and a 12-in. by two 10-in. guns. A mortar fired by high explosives and also a submarine gun are under consideration, the latter is intended to be used something in the way of a ram at close quarters. *Brown powder* has been successfully manufactured by Messrs. Dupont & Co., of Wilmington, giving with the 6-in. gun of 30 calibres 2000-ft. muzzle velocity, and with that of 35 calibres 2100-ft. velocity to the 100 lbs. projectile with a pressure of 15 tons. With larger calibres the same velocities and pressures are obtained with guns of 30 and 35 calibres length.

A high explosive, termed after its inventor Emmensite, is under trial. Its explosive power is about equal to that of gun-cotton; it is insensitive to friction, and the impact of projectiles is only locally ignited by flame, the combustion ceasing when the flame is withdrawn; and it bears changes of temperature well, and is uninjured by freezing. When confined it can be fired by a gunpowder fuze with an explosion resembling detonation.

As to naval mountings, it is proposed to employ electricity in the working of 8-in. guns. In the matter of machine guns and small arms, the United States Navy is waiting for the decision of the army as to calibre, but it appears to be likely that a small-arm rifle of a bore not less than 0·32 in. will be adopted, it being thought that the reduction of calibre has been pushed too far in Europe.

The Bethlehem Iron and Steel Works appear to be doing good work on a large scale, especially in the delivery of forgings of guns up to 13 inches calibre, and are to supply armour-plates for the Monterey in six months.

The Midvale Steel Company is preparing to supply forgings for guns also, which are to be taken in hand by the United States new Gun-factory.

Holtzer† Chrome steel projectiles have proved their power on a

* The Monterey is a coast defence vessel under construction.

† Received from Mr. L. Delbos, H.M.S. Britannia.

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Holtzer projectiles and shields.

larger scale than before, both in Russia and at Shoeburyness, as mentioned on p. 296. One of 344 kg. (758·4 lbs.) weight perforated and broke a Kolpino compound plate 18½ in. thick. At Shoeburyness on March 14 last a Holtzer projectile weighing 800 kg. (1764 lbs.) perforated and broke a shield made up of 20-in. Brown compound, backed by an 8-in. Cammell plate. The striking velocity was 2075 ft., the projectile passed on unbroken through backing and masonry.* More recently a 780 kg. (1720 lbs.) Holtzer projectile in France perforated with equal ease a solid steel 55-cm. (21·7-in.) plate passing on unbroken. The success of these projectiles of large calibre is a very important fact, seeing that Holtzer projectiles fired from the 6-in. gun have been used latterly in the most notable experiments. These are almost "unbreakable," but the question has naturally been asked whether larger projectiles could be manufactured approaching in excellence the standard exhibited in the smaller ones.

Sir Frederick Abel on explosives.

In his address, as president of the British Association, on 3rd September, Sir F. Abel reviewed the present condition of explosives. The history of the explosives during the last few years which was required to render such a review complete, brief as it was, necessarily contained matter that is familiar to naval officers, and much of the ground was covered by Sir Frederick's lecture on smokeless powder dealt with in the *Naval Annual* of last year. The following notes therefore may be sufficient :—

Sir Frederick pointed out that the series of experiments on the explosion of powders of various kinds made by Captain Andrew Noble himself many years ago had shown that the erosion, which makes short work with the linings of the bores of our guns, could be greatly reduced by employing a powder which "furnishes the largest proportion of gaseous products, and the explosion of which is attended by the development of the minimum amount of heat."

It was in Germany, however, that the powder which best fulfilled these conditions was first made, namely the well-kown "cocoa" or brown prismatic powder, whose products of explosion are simple and contain a large amount of water vapour, owing to the high porportion of water in the finished powder and the large amount of hydrogen in the slightly charred wood or straw used in it. It may be observed that the smoke of brown powder consequently disperses rapidly, owing to the absorption of the potassium salts by the water vapour.

With regard to smokeless powder, there is little to be added to Sir Frederick's statements last year. Admirable results can be

* This steel plate is said to be the thickest that has been perforated without fracturing the projectile.

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obtained experimentally, but the difficulty in its introduction into the service lies in its instability, a difficulty which is aggravated in the case of Great Britain by the necessity of storing it in magazines and on board ships in tropical stations. The difficulties in constructing gun-carriages and also fuzes to play the part called upon them respectively by charges giving very high velocities were noticed, especially if shells with bursting charges of high explosives are used, when the safety of the gun depends on the reliable behaviour of the fuze, a premature burst with a shell charged with a high explosive involving the destruction of any gun. Sir Frederick then noticed devices adopted to prevent premature explosion from other causes than misbehaviour of the fuze, with dynamite, blasting gelatine, and similar compounds employed in shells. These devices chiefly consist in the subdivision of the charge and reduction of friction. By such means nitro-glycerine may be kept from collecting all in one place in the shell, but at the cost of considerable interior capacity. Shells containing 500 lbs. of gun-cotton or dynamite are also projected safely through the agency of compressed air in the so-called dynamite guns. Grüson's ingenious system of employing nitric acid and a hydro-carbon confined separately inside a shell was next mentioned. Such a shell is incapable of explosion until the ingredients are mixed, which occurs very quickly as the shell moves forward, but considerable space is lost owing to the arrangements necessary to effect the end in view. Sir Frederick then pointed out that the accidents which have arisen with melinite detract from the weight of the claims made for it, and concluded by retaining his preference for wet gun-cotton as the safest form of high explosive for bursting charges of shells.

Captain Andrew Noble's address to the British Association.

Captain Andrew Noble's presidential address to the mechanical section of the British Association at Leeds, contained a remarkable review of the modern history of gunnery. The comparison between the old Victory gun and the present 110½-ton weapon is the same as was given and illustrated by a cut in the *Naval Annual* of 1887, p. 441. Captain Noble also compared the powers of the man-of-war of the present day with those of past generations, both as to armament, speed, and economy of fuel. Passing to guns in more detail, Captain Noble observed that while great energy can be got from guns with a maximum pressure of 17 tons in the bore, erosion is a difficult matter to deal with, the powders best in most respects being hitherto specially erosive. Admirable ballistic results, however, had been obtained with the Chilworth Company's *amide* powder, which at the same time has less erosive action than any other known in

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this country, but it is uncertain if its keeping qualities are sufficiently good to justify its admission into the service. With it the 6-in. gun obtained a muzzle velocity of 2500 ft. per second with moderate pressure, and still better results have been got with *cordite* by Sir F. Abel's committee, and this latter possesses the advantages of being a mechanical mixture instead of a chemical compound, of not being liable to detonation at all events in small charges, and of being nearly free from the intense and rapid ignition which produces violent wave pressure.

The modern working of ordnance Captain Noble illustrated by the system carried out in the Admiral and Nile classes, as well as in the new battle-ships approved in 1889. The ammunition, in some cases exceeding a ton in weight for a single round, is hoisted directly up from the shell-room into the armoured barbette; each cage is worked by hydraulic cylinders with automatic safety gear to lock it in case of any breakage; the rate of motion also is automatically decreased and stopped as the ammunition reaches its destination. In intimate connection with the hoists are the hydraulic telescopic rammers for the guns, and hydraulic cranes and traversing bogies are fitted in the shell-room, so that the shot moves from its store-home into the shot-chamber of the gun with no manual labour beyond the movement of the levers of the hydraulic gear. Each turn-table carrying the guns is worked by hydraulic gear, as well as the gun and carriage. In the station-vessels of the Re Umberto type an all-round loading is provided instead of a fixed loading-place, by bringing the ammunition up through a central hoist below the turn-table and transferring it to hoists behind the guns. This involves some cramping as to room, but has its advantages. As to speed, in the Benbow, the 110½-ton gun was "ready" in 2½ minutes from the word "load." The Trafalgar in her firing trials fired four rounds from one of her 68-ton guns in 9 min. 5 secs. In the Colossus under Captain Cyprian Bridge, the average time from round to round was 1 min. 45 secs., and on one occasion, steaming 8 knots an hour, she struck a target at 1500 yards' range, three times out of four rounds fired in 6 min. For manual working, the short low carriage and high slide of Vavasseur are employed; central pivots and line rollers belong to this system. It has practically been adopted by all countries.

With regard to the value of quick fire, Captain Noble instanced a firing trial made with two cruisers, one armed with ordinary and the other with Q.-F. guns, when the latter discharged about six times the quantity of ammunition fired by the former. Coast guns have

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latterly been mounted more frequently on the disappearing system first brought in by Colonel Moncrieff, compressed air in several chambers being sometimes used. At Maralunga, Spezia, in March 1890, the first 68-ton disappearing gun was tried with great success. An alternative system of land mounting, which has been successful, is to place the gun en barbette and protect the detachment while loading by a broad sloping shield fixed on the gun-carriage.

Longridge on smokeless powder.

Mr. Longridge has written a pamphlet investigating the conditions under which smokeless powder will be fired in our new-type guns, and what is the best form of gun to enable us to use its great power to the best purposes. Necessarily such an investigation involves calculation and formulæ, and the discussion of abstruse points, which it would be impossible to deal with here. In his calculations, Mr. Longridge relies, as in his previous work, almost wholly on M. Sarrau's formulæ. He remarks that the products of combination of the new powders are almost entirely permanent gases. The force is very great, and there is little or no fouling. The absence of solid residue would tend to diminish erosion, but the high temperature to increase it; probably, on the whole, the erosion will be less than with ordinary powder. He calculates that an energy of about 750 foot tons per ton of gun may be realised, while at present our 5-in. gun service has only 561 foot tons per ton of gun. It is to be expected that the slow burning of new powder will keep up the pressure towards the muzzle more than ever, necessitating strength forwards. Mr. Longridge further considers that *if the full advantage is to be obtained from the high ballistic properties of the new powder, it can only be obtained by the use of comparatively high pressure, and, consequently, very strong guns, such as can only be produced bythe wire system of construction.* He concludes finally: (1) That the smokeless powder has ballistic properties far superior to the old powder; (2) that erosive action will probably be less; (3) that our existing guns may be exposed to danger in the chase, although the maximum pressure of the new powder may be low, because great strength will be required well forward, but with really strong guns high ballistic results may be obtained by higher initial pressure in the bore of a gun of reasonable length. The author thinks this last the right solution of the question, wire being employed. A bore of 9 or 10 in. he thinks would be as large as need be required against the heaviest armour afloat. Probably most artillerists will join with Mr. Longridge in the wish that more active efforts had been made to bring wire guns into use. Since the "Jubilee round" was fired at Shoeburyness from a wire gun in 1888, very little has been heard of such pieces.

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III.

Quick-Firing Guns and Small Arms.

The great programme of experiments carried out by Grüson at Tangerhütte, near Magdeburg, last September, has been already mentioned (p. 283), with reference to the question of shielded mountings. With regard to quick-fire guns, Grüson's system was mentioned in the *Annual* for 1890, but as its action has not been described before, a brief notice of it may be desirable. The same action with a little modification is used in all calibres. It is shown in Figs. 25, 26 and 27, Pl. XX. It has been found to work with ease and rapidity, a rate of from thirty-five to forty rounds per minute having been realised. The cocking of the striker is effected by the downward movement of the breech block. There are of all kinds only twenty-two pieces in the mechanism. The general character of the action can be seen in these cuts without going into minute detail. The block B is hollowed out at the top, as shown in Fig. 27, for the passage of the ammunition. It slides up and down in its vertical slot when the hand-lever A is worked. Its downward movement is limited by a screw C, working in a vertical groove. The striker *b* is actuated by a spiral spring *c*, and is moved by levers d_1, d_2, on the shaft *d*. The trigger pin *e* is acted on by a flat spring. It is fired when mounted on a field carriage by a lanyard, which draws back the trigger and releases the striker. When mounted on a shielded carriage a special trigger is used, with a spindle passing through the side of the breech, provided with a thumb lever pressing on a second one when the trigger is pulled. In pieces where the striker gear is replaced by a simple hammer and lanyard, pulling directly to the rear, the number of pieces is reduced to eleven.*

The firing on Wednesday, September 24th, was almost wholly devoted to naval guns, and was as follows:—

(1) 5·7 cm. (2·24 in.) quick-fire gun on ship's mounting, muzzle

* *List of Authorities.—Engineer*, reports and cuts; *Times*, and information obtained directly from Elswick and Grüson.

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and final velocities being determined; the results of five rounds were as follows, the range being 1475 metres (1613 yards):—

		Muzzle velocity.		Final velocity.	
No.		Metres.	Feet.	Metres.	Feet.
1.	Elevation $1\frac{2}{16}$ degrees . . .	664	2178·5	378	1240·2
2.	„ „ . . .	666	2185·0	380·6	1248·7
3.	„ „ . . .	669	2194·9	380·9	1249·7
4.	„ „ . . .	667·5	2189·5	378·7	1243·5
5.	„ „ . . .	664·5	2179·7	..	..
	The recoil was 66 to 67 mm. (about 2·6 in.)				

(2) A 4·7 cm. (1·85 in.) 40-calibre quick-fire gun on ship's mounting, was fired for half-a-minute quick-fire; sixteen rounds were discharged in about twenty-five seconds, when the firing was interrupted by a charge not being pressed home and the edge burred.

(3) A 5·3 cm. (2·09 in.) 40-calibre quick-fire gun was fired at a target made to represent a torpedo boat, being constructed of the thickness of steel generally used, namely, 6·8 mm. (0·31 in.), and bulkheads of about double the thickness, at a distance of 500 metres. Thirteen rounds, fired in $2\frac{1}{4}$ min., produced the effects shown on Fig. 4, Pl. I. herewith. Blind steel shells were used. Five distinct grooves are shown on the left side; one A tore the side open, and one B, low down, entered and turned out again as it met the first bulk head. One shell entered at the stern and passed close beneath the lower edge of the first, second, and third bulkheads, perforating the thick angle steel framing under the fourth bulkhead at the rear of the target. One shell entered on the right in front of the second bulkhead, and passed obliquely through the third and fourth bulkheads.

(4) A 3·7 cm. (1·46 in.) 30-calibre quick-fire gun on boat mounting was next fired quick-fire for 1 min. 26 sec., when twelve rounds were fired and a fair diagram made on a target at 700 m. (766 yards) range, which need not be given, as there is nothing specially to be noted on it.

(5) A 7·5 cm. (2·95 in.) 25-calibre quick-fire gun on cone mounting, for naval service, with hydraulic brake, was fired quick-fire for half a minute, when twelve rounds were got off at a target at 2000 m. (2187 yards) range.

(6) An 8·2 cm. (3·23 in.) 35-calibre quick-fire gun on ship's mounting was fired by a detachment of three men and one non-com-

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missioned officer at a target at 2500 m. (2734 yards) range. Twenty rounds were fired; nine out of the first ten rounds missed the target or struck by ricochet.

A figure of a Grüson quick-fire gun on naval mounting was given in the *Annual* for 1890, Pl. xiv. The newer pieces are longer and more powerful. The special use of a mountain or field quick-fire gun is to pour in a fire of extraordinary rapidity at any required moment; its relation to an ordinary field gun being, in fact, the same as that of a magazine rifle to a single loader. This valuable power is obtained at the cost of the additional weight, inconvenience, and expense entailed by the use of fixed ammunition, in which projectile, charge and detonator are held in a copper case, which can be thrust into the breech with great speed, and which itself acts as an obturator at the breech joint. The scope for this action is limited in the field by the power of stopping, or very nearly stopping, the recoil; for if it is necessary to run up and re-lay the gun, the quick-fire speed in entering the charge is of little use. Hence it naturally follows that in the field, where carriages with hydraulic buffers cannot conveniently be used, quick-fire guns will be of very limited size, their value depending on the efficient action of their brakes. It is well to be clear on this point, in order to avoid any false application to quick-fire guns of what would be sound reasoning in considering the value of field guns. Quick fire must not be interfered with by recoil, and it is obvious that even a moderate recoil repeated every few seconds must interfere most seriously with it. At a supreme moment, however—as in the case of a rush at the battery, when accuracy is not necessary—a small recoil may be disregarded. A very fair instance of this may be seen in Tuesday's firing at Tangerhütte, when a 5·7-cm. (2·24-in.) gun fired case at cavalry targets at 1800 m., discharging eleven rounds in fifty-one seconds. At the end of the eleven rounds the piece had run back 6½ m.; but the gunner firing had been able to keep close to the trail.

Elswick Q.-F. gun trial.

Early in October last the Elswick Ordnance Company carried out some trials at their range at Silloth, in the presence of the First Lord and representatives of the Admiralty, Ordnance, and Explosive Committees, and of H.M.S. Excellent. The principal feature of the programme was the 6-in. quick-firing gun of 40 calibres length on a new mounting, suited for either upper decks or for placing between the deck batteries of the new cruisers. Cordite was employed as an experimental firing-charge. With this a muzzle velocity of 2669 feet per second has been obtained.

Five rounds with service projectiles and E X E powder were fired

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in 61 seconds, a target, consisting of 2 casks at 900 yards' range, being struck twice. With cordite charges, the same target was struck four times out of 5 rounds in 55 seconds. Five rounds with E X E were now fired, changing from one target to another, three targets being placed at ranges 900, 1400, and 1800 yards, and spread out so that the gun had to be traversed through a considerable arc of training in going from one to the other. The results were as follows:—1. 900 yards, hit target; 2. 900 yards, hit target; 3. 1400 yards, 50 yards over; 4. 1400 yards, hit target; 5. 1800 yards, hit target, cutting flagstaff.

The total time of these five rounds was 3 min. 43 sec., but a few seconds' delay was occasioned by the cap of a cartridge case, which was only temporarily secured for these experiments, falling off in the gun during loading, which necessitated reloading. As each round had to be carefully aimed on account of the change of targets, considerable delay was occasioned by the thick smoke which moved, under the influence of the very light breeze, almost directly up the range. Five rounds of cordite, under similar conditions to the last series, were now fired at the 900 and 1400 yards targets, the 1800 yards one being no longer visible. The results were as follows:—1. 900 yards, hit target; 2. 900 yards, hit target, cutting flagstaff; 3. 1400 yards, 10 yards over; 4. 1400 yards, five yards over; 5. 1400 yards, 20 yards over. The total time for these five rounds was 1 min. 37 sec.

The gun was then fired with 5°, 10°, 12°, 15°, and 20° elevation, with charges of E X E and cordite, to test the mounting, and with the exception of a little difficulty in running out when at 20° elevation, everything went perfectly. The cartridge cases gave no difficulty in extraction, and could be used repeatedly without any reforming process.

A new quick-firing gun of 2·75 in. calibre (throwing a 10 lb. projectile), specially designed for use in ships' boats, or as a naval field gun, to meet the requirement now felt for a quick-firing gun of intermediate power between the existing 6-pounder and 4·7 in. 45-pounder guns, and to replace the obsolete muzzle-loading 9-pounder, which now is exclusively in use as a field gun in our navy, was then submitted for trial. Ten rounds were fired for rapidity on the ship mounting in 56 seconds, and this speed could have been increased had the crew been a little more practised. A second series of five rounds was fired in 24 seconds, which was a marked improvement, and it was apparent that there would have been no difficulty after a little practice in firing 15 to 20 rounds in the minute. The

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gun was then lifted off the ship mounting and placed on the field mounting, ten rounds being fired at the target at 1400 yards' range, the last five being shrapnel shell, every one of which burst immediately in front of the target, throwing a shower of bullets round it. The recoil of the field carriage was only 6 ft. 3 in. with the wheels free. With the wheels toggled this was reduced to 2 ft. 2 in. It may be observed that characteristic peculiarities in the Elswick quick-firing system are the use of electric firing and the carrying out of the quick-fire principle in specially large calibres, the cartridge case being separated from the projectile in the 6-in. equipment.

The following points are to be noted in connection with the Elswick system of quick-fire ordnance. Electric firing is advocated for all except field pieces:—1st. As being more *certain*. The firing can be tested before use, a small inexpensive instrument being specially made for this purpose, which ensures no miss-fires occurring. It is very easy to fit duplicate electric firing-gear so as to provide against one set being damaged. In some of the latest mountings three sets have been supplied. If desired, however, it is easy to fall back on percussion. 2nd. As being *safe*. Loaded cartridges can be kept in magazines with their primers in place, and there is no danger in dropping a cartridge, nor can a cartridge be fired by a blow from the breech piece in closing. Further, it is easy to provide that the gun cannot be fired except in the proper firing position (*i.e.* run out with breech closed). Lastly, there is no danger in half cocking, such as exists with percussion firing. 3rd. *Simplicity*. The primer itself is less complicated, for example electric primers can always be filled again on board men-of-war. This cannot be done with percussion primers. The actual firing of the gun with electric gear can be done by pressing a trigger without exertion. This is not so with percussion gear, nor can safety arrangements be provided without complication.

On February 10th, 1891, a new 6-in. quick-firing gun and mounting, designed and supplied by Elswick, was tried on board H.M.S. Kite at Portsmouth. The programme was to fire 100 rounds in series of from ten to twenty as rapidly as possible. The projectile weighed 100 lb., the charge was 34 lb. E X E powder. Ten rounds were fired in 1 min. 32 sec. The gun was fired at angles of elevation up to 15°. Excellent practice was made alternately at targets so wide asunder that the gun had to be turned through 60° between each round, as well as which the elevation had to be altered. The electric firing circuit tester was tried with success. It will be noticed that this trial is important, the 6-in. gun being a very powerful

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piece, so that it has been regarded by many as beyond the scope of quick fire.

The magazine arm is not popular in the service, and the reason is not far to seek. The magazine arm.

The fact is that a magazine rifle is complicated under the best circumstances, and certainly needs experience to overcome the difficulties that must arise on subjecting it to service usage. When troubles arise, officers not unnaturally ask themselves what compensating advantages the arm possesses, and these are not such as specially commend themselves to skilled marksmen and musketry instructors. As has been from the beginning admitted, the magazine gives no advantage beyond the power to deliver eight or ten rounds, or whatever number the magazine may contain, with special rapidity. For continued fire, it is quicker to use the arm as an ordinary breech-loader, than to charge by using the magazine repeatedly; consequently, officers are apt to class the advantage offered by the magazine simply as a moral one, giving confidence to the soldier; but even this some lay little stress on, as they do not believe that the soldier could be kept from using his magazine on ordinary occasions, so that he would not even possess the sense of having this reserve ready to pour in at a 'supreme' or critical moment.

The main faults in the magazine action are, the attachment of the breech bolt to the bolt head by means of a single screw which is liable to get loose and escape, and the danger of the rifle being fired off accidentally by easing the springs when the magazine has been partly discharged and not shut off. Other faults of a less decided character exist, and the magazine entails complication and trouble; but it remains to be shown that this is not true of every known magazine action. Mr. Marjoribanks raised the question of the small bore, the composite bullet necessary for it, and the general efficiency of the rifle, in the House on February 3rd. The bore is a separate question from the adoption of a magazine. It may be observed that the calibres adopted by the principal European Powers are as follows: Germany, 0·310 in.; France, 0·315 in. Austria, 0·315 in.; Russia has not yet decided. England, therefore, in adopting 0·303 in., differs very little from them. Italy, Switzerland, China, Turkey, and also America, have a larger calibre, namely, the two former 0·409 in., and the three latter 0·433 in. Belgium has adopted 0·310 in. These figures in themselves speak strongly, and more so when accompanied by the fact that the decision in the case of the larger bores was in almost every case adopted before those of the smaller bores. Each decision constituted, in fact,

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a reduction on the 0·45-in. bore, which was itself a reduction on the contemporaries of the Enfield calibre of 0·577 in. A very small bullet wound may produce very little effect on a determined man, but it will generally do its work; and more rounds of such ammunition can be carried, and also contained in a magazine. England and France adopted at first a magazine containing eight rounds, against five contained in that of most other Powers. Undoubtedly, the question of the bullet and ammunition is troublesome, but it is being got over gradually.

"With regard to the actual magazine action, some of the questions raised had the sound of being first thoughts on the matter. Colonel Nolan spoke with authority and with a professional grasp of the subject, he having during his time of service in the Royal Artillery specially devoted himself to manufacturing and scientific work; and Colonel Nolan, though a keen enough opponent of the Government, spoke in favour of our magazine arm. With regard to the bolt-head screw, Mr. Marjoribanks ran his head into the popular mistake that it bore the strain of recoil. That it does nothing of the kind anyone can prove very easily by firing a rifle with the screw removed altogether. The rifle would behave as usual until the bolt was drawn back, when the bolt would come away from the head, which would be left with the cartridge at the entrance to the chamber. However, as the bolt head is now secured without any screw, this objection is removed.

"As to the succession of patterns marking the introduction of changes, the only way to avoid it is to perfect the rifle more fully before it is issued; but this means long and very mischievous delay in order to do piecemeal what an issue on a large scale settles much more satisfactorily. We shall run through several successive patterns most likely; but if the changes are small, this is a matter of little moment, for it does not at all mean that each pattern is condemned or necessarily superseded at once by the following one, but only that some improvement has been adopted, and in order to identify the rifles in which it is embodied a fresh pattern is sealed, and the rifles which are made in conformity to it are marked accordingly.

"The question may be divided into the following branches:—(1) Is a small bore desirable? The great majority of those who know much about the matter will say, Yes. This entails some of our difficulties. (2) Is smokeless powder necessary? Yes, would be the answer from almost everyone. This entails difficulty and delay in perfecting ammunition. (3) Is a magazine arm desirable? About this the answer is more doubtful. Yet, for the reasons enumerated

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in Colonel Slade's paper (see *Annual* for 1890), the weight of opinion of officers experienced in war would be in favour of the magazine arm. Fourth and last, Is the magazine now under trial in this country the best extant? This question is very difficult indeed to answer. Hitherto it has not been shown that any other is better.

"On the whole, the *Times* has done good service in raising the question; but the troubles experienced are those inherent to the task before us, and we must get through them as best we can. The most important question in connection with small arms is the efficient control of infantry fire in the field. It would be well if more attention could be directed to this. The entire advantage of magazines—nay, of breech-loaders—depends on such control."

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Tables of British and Foreign Guns.

NOTE.—The greater part of the following Tables have been taken from the *Austrian Marine Almanack* for 1891.

Some Energies and Perforations are calculated afresh.

The British Table is the official one previously used, corrected up to date.

The chief alterations are in the Tables for Russia, Spain, Sweden, and the United States. No official Table appears to exist for the last mentioned. Major Post, the Military Attaché in London, has kindly furnished some figures as to recent U.S. guns.

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ARMY AND NAVY GUNS.

RETURN to an Address of the Honourable The House of Commons, dated 20 February, 1890;—*for*,

"RETURN showing the Number, Description, Name of Designer, Place of Manufacture, and Actual Cost of the various RIFLED IRON and STEEL GUNS supplied by the WAR DEPARTMENT to the NAVAL and LAND SERVICE during the Year 1888-9, showing whether each GUN is LAND or NAVAL (in continuation of Parliamentary Paper, No. 95, of Session 1889)."

War Office,
23 August, 1890.

EDWARD STANHOPE.

RETURN showing the Number, Description, Name of Designer, Place of Manufacture, and Actual Cost of the various RIFLED IRON and STEEL GUNS supplied by the WAR DEPARTMENT to the NAVAL and LAND SERVICE during the Year 1888–89, showing whether each GUN is LAND or NAVAL (in continuation of Parliamentary Paper, No. 95, of Session 1889).

I.—ISSUED FOR LAND SERVICE.

Number Issued.	Nature.	Designer.	Maker or Place of Manufacture.	Actual Cost.		Remarks.
				Each (average).	TOTAL.	
	B. L.:			£ s. d.	£ s. d.	
1	9·2-inch . IV.	Royal Gun Factory .	Royal Gun Factory .	4,138 6 1	4,138 6 1	Armaments.
1	6-inch . . V.	Armstrong & Co. .	Armstrong & Co. .	1,025 1 0	1,025 1 0	
3	5-inch . . IV.	Royal Gun Factory .	Royal Gun Factory .	585 16 8	1,757 10 0	Colonial Repayments.
96	12-pr. . . I.	" "	" "	228 8 8	21,929 13 8	45 Armaments, 51 India.

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Quick-Firing Guns:						
20	Hotchkiss, 6-pr. I.	Hotchkiss . . .	Hotchkiss . . .	381 17 1	7,637 1 8	Armaments.
12	Nordenfelt, 6-pr. II.	Nordenfelt . . .	Nordenfelt . . .	347 18 11	4,175 7 4	India.
18	Hotchkiss, 3-pr. I.	Hotchkiss . . .	Hotchkiss . . .	261 15 2	4,711 12 5	India.

II.—Issued for Naval Service.

	B. L.:					
1	16·25-inch . .	Armstrong & Co. .	Armstrong & Co. . .	19,528 7 11	19,528 7 11	
4	13·5-inch . II.	Royal Gun Factory .	Royal Gun Factory .	11,093 12 11	44,374 11 8	
5	12-inch . . V.	,, ,, .	Whitworth & Co. . .	7,270 7 10	36,351 19 0	
2	9·2-inch . V.	,, ,, .	Armstrong & Co. . .	4,631 17 8	9,263 15 4	
4		,, ,, .	Royal Gun Factory .	3,899 19 5	15,599 17 7	
2	8-inch . . IV.	,, ,, .	Armstrong & Co. . .	2,308 16 6	4,617 13 1	
3	8-inch . . III.	,, ,, .	,, ,, . .	2,129 8 4	6,388 5 1	
3		,, ,, .	Royal Gun Factory .	1,885 15 1	5,657 5 2	
9	6-inch . . IV.	,, ,, .	Armstrong & Co. . .	1,034 2 0	9,306 18 0	
16	6-inch . . IV.	,, ,, .	Whitworth & Co. . .	1,233 3 1	19,730 9 4	
38	6-inch . . IV.	,, ,, .	Royal Gun Factory .	1,060 9 1	40,297 6 2	
1	6-inch . . III.	,, ,, .	,, ,, .	780 8 0	780 8 0	
26	5-inch . . IV.	,, ,, .	,, ,, .	542 13 3	14,109 6 0	
12	5-inch . . III.	,, ,, .	,, ,, .	492 16 3	5,913 14 11	
26	4-inch . . V.	,, ,, .	,, ,, .	398 2 9	10,351 11 9	
6	4-inch . . IV.	,, ,, .	,, ,, .	340 17 1	2,045 2 3	
	Quick-Firing Guns:					
46	Hotchkiss, 6-pr. I.	Hotchkiss . . .	Hotchkiss . . .	340 9 0	15,660 12 6	
5	Nordenfelt, 6-pr. II.	Nordenfelt . . .	Nordenfelt . . .	272 5 10	1,361 9 2	
190	Hotchkiss, 3-pr. I.	Hotchkiss . . .	Hotchkiss . . .	250 0 11	47,509 2 3	

War Office,
26 August, 1890.

Ralph Thompson.

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BRITISH RIFLED ORDNANCE.

(Chiefly founded on the official "List of Service Rifled Ordnance, 1888," corrected up to date.)

Ordnance.														Charge (full).	Projectile.					Ballistics (with full charges).				
Nature.					Chamber.			Rifling.														Perforation of wrought iron.		
	Calibre or Pr.	Weight.	Mark and Service.	Total length in inches.	Length of Bore, including Chamber.	Diameter.	Length to base of projectile.	Capacity.	Twist one turn in: Least at breech.	Twist one turn in: Greatest at muzzle.	Twist one turn in: Distance at muzzle twist is uniform.	System.*		Weight.†	Diameter.	Weight.‡	Value of $\frac{d^3}{w}$.	Value of $\frac{w}{d^2}$.	Muzzle velocity.	Total muzzle energy.	Muzzle energy per ton of gun.	At muzzle.	At 1000 yards range.	At 2000 yards range.
					calbs.	ins.	ins.	cub. ins.	cals.	cals.	ins.			lbs.	ins.	lbs. ozs.			f. s.	ft. tons.	ft. tons.	ins.	ins.	ins.
B.L. Guns (new type).	16·25-in.	111 tons.	I. S.	524·0	30·0	21·125	84·5	28,660	130	30	77·3	P.	960 S.B.C. 850 WBPr.	16·25	1800 0	0·146	0·421	2104 2148	55,250 57,580	498 518·8	34·5	..	..
	13·5-in.	67 tons.	I. II. III. S.§	433·0	30·0	18·0	66·5	17,100	120	30	131·0	P.M.B.	630 S.B.C.	13·5	1250 0	..	..	2025	35,560	530·7	30·4	28	26
	12-in.	45 tons. 44 tons.	IV. V. S. III.	328·5	25·13	16·0	48·0	9,666	120	35	125·5	P.M.B.	295 Pr.[1]B.	12·0	714 0	0·202	0·413	1892	18,060	420·1	22·5	20·6	18·8
	10-in.	29 tons.	II. III.	320·0	32·0	14·0	54·0	8,870	120	30	166·7	P.M.B.	250 Pr.[1]B.	10·0	500 0	..	..	2100‖	15,290	527	23	21·0	19
	9·2-in.	21 & 22 tns.	I. II. S.	250·8	25·0	11·0	44·0	4,300	120	35	76·1	P.M.B.	144 Pr.[1]B.	9·2	380 0	..	..	1809	8,622	411 392	18·0	17	15
	9·2-in.	24 & 22tns.	III. V. VI. S.	310·0	28·4	12·0	43·0	5,000	120	30	120·4	P.M.B.	170 Pr.[1]B.	9·2	380 0	0·238	0·477	2065	11,230	511·1	20·3	19	17
	8-in.	14 tons.	VI. S.¶	254·5	29·6	10·5	38·0	3,350	120	35	96·1	P.M.B.	125 Pr.[1]B.	8·0	210 0	0·305	0·410	2200‖	7,060	508·2	17·4	16	14
	6-in.	5 tons.	IV. & VI. S.	173·5	26·0	8·0	26·75	1,380	120	35	61·75	P.M.B.	42 Pb.[2]	6·0	100 0	0·360	0·433	1960	2,665	533	12·5	10·0	8·0
	5-in.	40 cwt.**	III. & IV. S.	139·5	25·06	5·75	19·05	504	120	25	51·8	P.M.B.	16 S.Pb.	5·0	50 0	0·500	0·400	1800	1,123	561	9	7	5
	4-in.	26 cwt.	IV. & V. S.	120·0	27·0	5·3	18·5	417	120	30	43·77	P.M.B.	12 S.Pb.	4·0	25 0	0·640	0·391	1900	625·1	500·8	7·3	6	5
	4-in.	13 cwt.	I. S.	66·0	14·81	4·5	8·12	126·5	116	35	11·39	P.M.B.	3½ R.L.G.[2].	4·0	25 0	0·640	0·391	1180	242	372	4	3·4	3·0
	12-pr.	7 cwt.	I. L.	92·3	28·0	3·625	11·0	117	120	28	35·8	P.M.B.	4 S.Pb.	3·0	12 2	0·720	0·463	1730	252	720	..	..	..
M.L. Guns.	17·72-in.	100 tons.	I. L.	391·8	20·43	19·7	59·72	16,957	150	50	2·88	P.M.M.	450 Pr[1] or [2]B	17·72	1968 0	0·159	0·374	1548	32,710	327	24·5	23	21
	16-in.	80 tons.	I. S. & L.	321·0	18·0	18·0	59·6	14,600	0	50	0	P.M.M.	450 Pr.[1]B.	16·0	1684 0	0·152	0·411	1590	29,530	369	25	23	22
	12·5-in.	38 tons.	II. S. & L.	230·0	15·84	14·0	41·125	6,000	438	35	0	W.	210 Pr.[3] or Pr.[1] black 190	12·5	809 12½	0·193	0·415	1575	13,930	366·6	19·4	18	16
	12-in.	35 tons.	I. S. & L.	195·0	13·54	Unchambered			0	35	0	W.		140 Pb.[2]	12·0	706 12	0·204	0·409	1390	9,469	250·5	16	15	13
	12-in.	25 tons.	II. S. & L.	182·5	12·09	,,			100	50	0	W.		85 Pb.[2]	12·0	608 12	0·237	0·352	1288	7,006	281·8	13·5	12	11
	11-in.	25 tons.	II. S. & L.	180·0	12·09	,,			0	35	0	W.		85 Pb.	11·0	543 14	0·223	0·408	1314	6,561	262·4	15·6	14	13
	10-in.	18 tons.	II. S & L.	180·0	14·55	,,			100	40	0	W.		70 Pb.	10·0	406 9	0·246	0·406	1379	5,360	297·5	13	12	10

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M.L. Guns.	9-in.	12 tons.	V. S. & L.	156·0	13·88	Unchambered.			0	45	0	W.	50 Pb.	9·0	253	9	0·320	0·347	1440	3,695	304	11·7	10	9
	9-in.††	12 tons.	VI. S.	156·0					100	35	81	P.	..	9·0	..		..	..	..	..	..	..	..	..
	8-in.	9 tons.	III. S.	144·0	14·75	,,			0	40	0	W.	35 Pb.	7·92	174	12	0·359	0·352	1384	2,391	258	9·6	8	7
	7-in.	90 cwt.	I. S.	131·0	15·88	,,			35	35	All	W.	22 Pb.	6·92	112	1	0·427	0·338	1325	1,400	303	8	7	6
	7-in.	6½ tons.	III. S. & L.	133·0	15·88	,,			35	35	All	W.	30 Pb.	6·92	112	1	..	..	1525	1,805	278	9·3	8	6
	7-in.	7 tons.	IV. L.	148·0	18·0	,,			35	35	All	W.	30 Pb.	6·92	112	1	0·427	0·338	1561	1,892	270	9·6	8	6
	6·6-in.	70 cwt.	I. L.	118·0	14·78	6·8	21·0	709	100	35	13·2	P.M.M.	25 Pb.	6·6	97	12	0·446	0·340	1416	1,358	388	..	..	..
	64-pr.	64 cwt.	I. II. L.	I. 120·0 II. 119·5	15·55	Unchambered.			40	40	All	Pl.	6½ R.L.G.[4]	6·28	64	8	0·588	0·271	1125	565	177	..	..	..
	64-pr.	64 cwt.	III. S. & L.	118·0	15·55	,,			40	40	All	Pl.	10 R.L.G.[4]	6·28	64	8	0·588	0·271	1390	897	270	..	..	..
	40-pr.	35 cwt.	II. L.	120·0	22·0	,,			35	35	All	W.	6¾ R.L.G.[4]	4·75	39	8½	0·552	0·382	1415	548	313	..	..	..
	25-pr.	18 cwt.	I. L.	98·0	22·0	,,			35	35	All	W.	4½ R.L.G.[4]	3·94	24	15	0·605	0·420	1363	322	358	..	..	..
	16-pr.	12 cwt.	I. L.	78·0	19·0	,,			30	30	All	F.M.	3 3/16 R.L.G.[2]	3·54	16	1½	0·771	0·366	1355	199	332·7	..	..	..
	15-pr.	422 lbs.	I. L.‡‡	70·5	20·0	3·2 (decreased)			60	20	24	M.M.	..	3·3	15·0		..	..	1040	113	..	..	..	..
	13-pr.	8 cwt.	I. L.	92·1	28·0	3·15	14·13	109	100	30	9·0	P.M.M.	3¼ R.L.G.[4]	3·0	13	0¼	0·689	0·484	1596	229	572	..	..	..
	9-pr.	6 cwt.	II.III.S.&L. I. II. III. IV. S. & L.	74·5 72·0	22·0 21·17	Unchambered.			30	30	All	F.M.	1⅞ R.L.G.[2] and 1½ R.L.G.[2]	2·94	9	0	0·946	0·359	1330	119	403	..	..	..
	2·5-in.	400 lbs.	I. L.	70·45	26·6	2·56	11·07	54	80	30	3·53	P.M.M.	1½ R.L.G.[2]	2·5	7	4	0·893	0·448	1440	101	566	..	..	..
	7-pr.	200 lbs.	IV. S. & L.	41·0	12·0	Unchambered.			20	20	All	F.	¾ R.F.G.	2·94	7	5¼	1·181	0·288	950	46	515	..	..	..
R.B.L. guns (screw).	7-in.	82 cwt.	S. & L.	120·0	14·21	7·2	16·0	620·0	37	37	All	P.	11 RL.G.[2]	7·0	109	0	0·450	0·318	1100	915	223	..	..	..
	40-pr.	35 cwt.	S. & L.	121·0	22·39	4·96	13·5	257·8	36½	36½	All	P.	5 R.L.G.[2]	4·75	40	9	0·562	0·374	1180	391	223	..	..	..
	20-pr.	16 cwt.	L.	96·0	22·4	3·94	12·0	143·0	38	38	All	P.	2½	3·75	22	1½	0·645	0·414	1130	196	245	..	..	..
		15&13cwt.	S.	66·125	14·43	3·94	11·0	131·0	38	38	All	P.	2½ R.L.G.[2]	3·75	22	1½	0·645	0·414	1100	186	248	..	..	..
	12-pr.	8 cwt.	S. & L.	72·0	20·458	3·2	8·5	66·0	38	38	All	P.	1½ or	3·0	11	4	0·800	0·417	1239	120	283	..	..	..
	9-pr.	6 cwt.	S. & L.	62·0	17·5	3·2	7·0	55·1	38	38	All	P.	1⅝ R.L.G.	3·0	8	8½	1·059	0·315	1055	66	220	..	..	..
	6-pr.	3 cwt.	S. & L.	60·125	21·2	2·625	7·0	37·9	30	30	All	P.	¾		5	15			1046	45	300			
Quick-firing Guns.																						Mild steel plate.		
Hotchkiss . 6-pr.		8 cwt.	S.	97·63		..	..	..	..	..	..	..	1 15½	2·24	6	0	0·844	0·527	1820	137·8	344·5	3·2	2·0	..
Nordenfelt . 6-pr.		6 cwt.	I. & II. S.	104·4		..	..	..	0	26	0	..	1 15½	2·25	6	0	0·844	0·527	1860	143·9	479·6	3·3	2·1	..
Hotchkiss . 3-pr.		4 cwt.	S.	80·63		..	..	..	25	25	All	..	1 8	1·85	3	8	0·978	0·553	1873	77·6	485·5	2·9	1·8	..
Ordnance Q.F. 4·7 in.		2 tons.	S.	194·1		..	..	..	100	34·4	30	P.	..	..	..		..	..	..	..	..	..	..	..
Machine Guns.													grains.	oz.	grs.									
Nordenfelt, 4 bar. 1-in.		447 lbs.	III. S.			..	..	..	35	35	All	H.	625	1·0	7¼	0	2·207	0·453	..	..	..	¼-in. at 200 yards.		
Gatling, 10 bar 0·65-in.		787 lbs.	S. & L.			..	..	..	46·5	46·5	All	H.	270	0·65	0	1422	2·109	0·730	..	..	..	Not known.		
Gardner, 2 bar 0·45-in.		131 lbs.	S. & L.			..	..	..	22·0	22·0	All	H.	85	0·450		480	2·952	0·751	..	..	..	Same as MH. bullet.		

S., Sea-service gun; L., Land-service. The Roman numeral is the number of the pattern given.

* P means Polygroove; M.M., Maitland muzzle-loading, and M.B., Maitland breech-loading; Pl., Plain; W., Woolwich; F., French; F.M., French modified; H., Henry. † S.B.C. (in column for charge) means Slow-burning Cocoa; W.B.Pr., Westphalian Brown Prism; P.B. stands for Prismatic Brown; Pb., Pebble; R.L.G., Rifle Large Grain; L.G., Large Grain. ‡ For the higher natures the weight of projectile given is for Palliser shot; for the lower natures it is for filled common shell. § Further differences in pattern indicated by letters A, B, and C. ‖ Estimated. ¶ Patterns Marks III., IV., and V. differ from VI. chiefly in length, weight, and muzzle velocity. ** There is an 80-pr. Elswick gun of 81 cwt. mounted on H.M.S. Rover, also 4 in Mark I. of 22 cwt., and II. and III. of 23 cwt. †† For high-angle fire. ‡‡ Mountain-service jointed gun.

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AUSTRIAN NAVAL ORDNANCE.

	Krupp Steel B.L. Guns.													Uchatius. St., Br.					Cast Iron BL.
Designation by Calibre, in centimètres	30·5	28 L. 22	26 L. 22	24 L. 35 C. 86	24 L. 35 C. 86	24 L. 22	21 L. 20	15 L. 35 C. 86	15 L. 35 C. 80	15 L. 26	15 L. 26	12 L. 35 C. 80	12 L. 35 C. 87	15 L. 25	15 L. 37	12 L. 35	9 L. 24	7 L. 15	15 L. 21
Calibre, in inches	12·01	11·02	10·24	9·45	9·27	9·27	8·24	5·87	5·87	5·87	5·87	4·72	4·72	5·87	4·72	4·72	3·43	2·60	5·87
Length — Total, in Feet	35·11	20·01	18·77	27·60	17·16	15·45	13·73	17·13	17·13	12·63	12·63	13·8	13·8	12·19	14·38	13·97	6·76	3·28	10·13
Length — Rifled Portion, in inches	314·8	169·8	148·4	233·2	135·9	115·3	105·0	151·4	149·6	105·7	111·6	128·5	126·3	111·4	123·2	123·8	57·5	23·8	89·8
Length — Powder Chamber ,,	69·9	37·4	46·1	69·3	41·7	41·7	37·0	37·8	35·4	29·3	23·4	24·0	26·3	23·6	36·6	31·65	16·5	11·0	18·0
Length — Of bore in calibres	35	18·8	19·0	35	19·2	16·9	17·2	35	31·5	23·0	23·0	32·3	32·3	23·0	37	32·9	21·6	13·4	18·4
No. of Grooves	68	64	32	25	32	32	30	36	36	24	36	32	32	36	32	32	24	18	30
Twist in calibres	..	45	70	26·9	70	64·7	59	45—25	25	68·4	45	25	25	45	45—25	25	45	30	63·2
Weight — Gun, tons	47·8	27·1	21·7	26·5	14·6	14·5	8·68	5·7	4·69	3·94	3·94	2·25	2·46	3·35	3·2	2·85	0·479	0·09	2·81
Weight — Breech Block, in lbs.	..	2315	1951	..	1411	1422	1080	..	..	321·9	321·9	..	..	209·4	..	211·6	55·1	18·7	176·4
Weight — Steel Shell ,,	1003·1	557·8	395·7	474·0	292·1	292·1	206·6	112·5	86·0	72·8	84·9	57·3	57·3	84·9	57·3	57·3	..	..	..
Weight — Chilled Shell ,,	..	..	..	..	..	308·6	196·2	..	..	..	..	..	..	..	..	..	..	..	..
Weight — Common Shell ,,	1003·1	488·3	354·2	474·0	263·5	263·5	172·0	112·5	69·9	$\frac{67·2}{65·5}$	69·4	57·3	57·3	69·45	57·3	57·3	$\frac{14·02}{14·22}$	6·42	6·11
Weight — Shrapnel Shell ,,	..	..	..	..	..	..	..	112·5	71·9	$\frac{67·2}{65·5}$	69·4	57·3	57·3	69·45	57·3	57·3	15·76	6·88	6·79
Weight — Case Shot ,,	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16·53	6·94	38·4
Weight of Bursting Charge — Steel Shell ,,	10·6	14·3	8·8	5·1	6·6	6·6	4·4	..	1·76	1·65	2·09	0·55	0·55	2·09	0·53	0·55	..	..	..
Weight of Bursting Charge — Chilled Shell ,,	..	..	..	..	..	3·75	..	..	..	..	..	..	..	..	..	..	..	..	..
Weight of Bursting Charge — Common Shell ,,	35·7	18·7	20·3	17·9	15·0	15·0	15·0	..	3·86	3·86	5·07	2 2	2·2	5·07	2·20	2·21	0·46	0·18	1·87
Weight of Bursting Charge — Shrapnel Shell † in lbs.	..	..	..	..	..	..	..	..	1·10	1·08	1·08	0·57	0·57	1·08	0·57	0·57	0·20	0·09	0·90
Weight of Firing Charge — Steel and Chilled Projectile, in lbs.	308·6	123·5*	89·3 B	..	76·1 B	52·9	50·7 C	..	38·8	21·6 C	20·9 C	19·8 B	..	20·9 C	30·0 B	19·8 B	..	..	..
Weight of Firing Charge — Common Shell, in lbs.	308·6	123·5*	59·5	..	44·1	44·1	30·9	..	38·8	$\frac{14·3}{21·6}$	20·9 C	19·8 B	..	20·9 C	30·0 B	19·8 B	$\frac{3·31}{0·97}$	$\frac{677 O}{0·35}$	4·74
Weight of Firing Charge — Exercising, in lbs.	154·3	68·3	59·5	..	44·1	44·1	30·9	..	19·6	21·6 C	20·9 C	11·0	..	20·9 C	19·8 B	12·13 B	3·31	$\frac{0·77 O}{0·35}$	4·74
Weight of Firing Charge — Saluting ,,	19·8	19·8 O	19·8 O	..	15·4 O	15·4 O	8·82 O	..	4·74 O	4·74 O	4·74 O	..	..	4·74 O	..	..	0·88 O	0·35	4·74
Muzzle Velocity, in feet	1755·3	1568	1575	..	1421	$\frac{1378}{1345}$	1519	..	1969	1641	1562	1738	..	1562	1942·3	1755	1470	978	1017
Muzzle Energy — Total, foot-tons	21,420	9513	6808	..	4087	3847	3306	..	2312	1358	1435	1201	..	1435	1499	1224	..	..	..
Muzzle Energy — Per inch circumference, foot-tons	567·8	270·4	211·6	..	140·4	132·1	127·7	..	125·4	73·7	77·9	81·0	..	77·9	101·1	82·45	..	..	..
Thickness of Iron, perforated inches at Muzzle	24·8	17·0	15·0	..	12·1	11·7	11·6	..	11·7	8·8	9·1	9·4	..	9·1	10·54	9·45	..	..	..

NOTE.—P stands for pebble powder; C for cube powder; * prismatic powder; O ordinary powder (inferior); B brown prismatic. † Generally steel.

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DANISH NAVAL ORDNANCE.

	Krupp B.L. Guns designated.										Armstrong M.L.						Finspong.
Designation by Calibre	35·5 cm.	30·5 cm.	26 cm. long.	26 cm. short.	15 cm. long.	15 cm. medium.	15 cm. short.	12 cm. long.	12 cm. short.	8·6 cm.	10 in.	10 in.	10 in.	9 in.	8 in.	8 in.	6 in.
Calibre, in inches	13·98	12·01	10·24	10·24	5·91	5·91	5·91	4·72	4·72	3·43	10·0	10 in.	10 in.	9·0	8·0	8 in.	6·04
Total length, in feet	29·1	22·0	32·8	18·77	17·1	12·63	10·7	11·8	9·6	6·9	17·0	14·5	14·0	13·0	10·8	10·8	9·5
Length of Bore, including Powder Chamber — in inches	304·7	227·2	327·6	194·5	190·3	135·0	112·9	128·8	102·4	73·6	175·5	145·5	140·0	125·0	104·2	104·2	100·8
Length of Bore, including Powder Chamber — in calibres	21·8	18·9	32·0	19·0	32·2	22·8	19·1	27·3	21·7	21·3	17·5	14·55	14·0	13·3	13·1	13·1	16·7
Number of Grooves	80	68	60	60	36	36	36	32	32	24	7	7	7	6	6	6	6
Twist of Rifling, in calibres	45	45	70·25	45	70·25	45	45	25	40	45	40	40	40	40	50	50	40
Total weight, including Breech-gear, tons	51·2	35·4	27·6	21·5	4·6	3·9	3·5	2·13	1·36	0·49	20·0	18·5	18·0	12·5	8·65	7·04	2·46
Weight of — Breech Block, lbs.	4695·8	2910	1982	1940	390·2	330·7	324·1	229·2	176·4	101·4	..	..	..	..	..	..	..
Weight of — Steel Shell, „	1157·4	725·3	451·9	451·9	112·4	..	..	..	..	..	..	..	..	..	..	..	..
Weight of — Chilled Shell, „	1157·4	725·3	..	451·9	..	86·0	86·0	..	44·1	..	400	400	400	250·2	165·3	..	..
Weight of — Common Shell, „	1157·4	621·7	451·9	391·3	112·4	69·4	69·4	57·3	36·2	14·3	400	400	400	250·2	131·2	..	55·1
Weight of — Shrapnel Shell, „	..	..	..	..	..	..	..	..	..	..	..	..	..	..	149·9	..	15·4
Weight of — Case Shot, „	..	..	..	..	..	..	..	..	..	..	191·8	..	..	154·3	127·9	..	58·4
Weight of Bursting Charge — Steel Shell, „	27·6	18·5	11·5	11·5	2·2	..	..	..	..	..	..	..	..	..	..	..	..
Weight of Bursting Charge — Chilled Shell, „	..	9·9	..	6·0	..	1·1	..	..	0·55	..	4·4	4·4	4·4	..	..	..	..
Weight of Bursting Charge — Common Shell, „	33·5	32·6	23·1	20·9	5·62	4·2	4·19	1·21	2·4	0·44	26·5	26·5	26·5	18·5	7·5	7·5	5·0
Weight of Firing Charge — Steel or Chilled Shell, lbs.	297·6	158·7	191·8	99·2	40·8	18·7	22·0	..	8·8	..	69·4	69·4	69·4	43·0	29·8	29·8	..
Weight of Firing Charge — Common Shell, „	297·6	158·7	191·8	99·2	40·8	18·7	22·0	18·2	8·8	3·3	69·4	69·4	69·4	34·2	19·8	19·8	60·6
Muzzle Velocity — Armour-piercing Projectile, feet	1619	1558	2064	1558	1789	1562	1542	..	1416	..	1457	1404	1388	1368	1378	1378	..
Muzzle Velocity — Common Shell, „	1619	1673	2064	1673	1789	1683	1690	..	1549	1457	1457	1404	1388	1214	1230	1230	1076
Muzzle Energy — Total foot-tons	20970	12200	13550	7605	2494	1455	1418	..	6130	..	5889	5467	5347	3244	2177	2177	..
Muzzle Energy — Per inch circumference, foot tons	477·5	323·5	421·4	236·4	134·4	78·4	73·0	..	32·8	..	189·0	175·3	171·6	115·8	86·9	86·9	..
Perforation at Muzzle, in inches	22·5	18·56	21·5	15·86	12·1	9·1	8·8	..	5·8	..	14·1	18·5	13·3	11·0	9·5	9·5	..

NOTE.—Chilled projectiles will gradually be replaced by steel.

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DUTCH NAVAL ORDNANCE.

	Krupp Breech Loading.					Armstrong Muzzle Loading.			Dutch Breech Loading.		
Designation by Calibre, in centimètres	28	21	17	15	12 No. 1.	28	23	18	12 No. 2.	12 No. 3.	7·5
Calibre, in inches	11·02	7·91	6·80	5·87	4·72	11·00	9·00	7·00	4·72	4·72	2·95
Total Length, in feet	20·01	24·04	13·94	12·63	6·89	14·42	13·00	11·00	6·89	6·89	7·87
Length of Rifled Portion of bore, in inches	170·8	222·2	112·7	111·8	61·4	119·0	104·0	95·5	61·4	61·4	43·2
Length of Powder Chamber „	36·4	42·4	36·0	23·2	13·0	26·0	21·9	15·5	13·0	13·0	6·7
Length of bore, in Calibres	18·8	35	21·9	23·0	15·8	12·1	14·0	15·9	15·8	15·8	17·5
Number of Grooves	64	48	42	36	12	9	6	3	12		20
Depth of Grooves, inches	0·069	0·059	0·118	0·118	0·049	0·20	0·18	0·18	0·118		0·049
Twist of Rifling in Calibres	45	∝ 25	45	40	40	∝ 45	∝ 45	35	40	40	∝ 30
Total Weight, in tons	27·21	12·79	5·51	3·94	0·79	24·46	12·50	7·17	0·93	0·90	0·21
Firing Charge — Armour Piercing Projectile, in lbs.	121·3	99·2	27·6	20·9	..	86·0	50·7	30·0			..
Firing Charge — Common Shell „	121·3	99·2	27·6	20·9	2·43	86·0	50·7	13·9	2·43		0·82
Weight — Armour-piercing Projectile „	560·0	308·6	132·3	86·0	41·0	533·5	249·1	114·6	..		..
Weight — Common Shell „	476·2	308·6	112·4	69·4	29·5	535·7	262·4	116·8	29·5		9·5
Weight — Case Shot „	273·4	..	63·9	41·9	26·5	185·2	149·9	68·3	26·5		9·3
Bursting Charge — Armour-piercing Projectile „	6·6	4·6	2·2	1·1	0·44	4·4	2·2	2·2	..		..
Bursting Charge — Common Shell „	26·5	12·3	6·6	6·6	2·0	28·7	17·6	8·8	1·8		0·44
Muzzle Velocity, feet	1558	1739	1558	1558	971	1332	1476	1558	951		958
Muzzle Energy — Total, in foot-tons	9423	6471	2226	1447	..	6563	3763	1929	..		..
Muzzle Energy — Per inch Circumference, foot-tons	272	260·7	104	84	..	191	134	89	..		..
Perforation at Muzzle, in inches	17·0	16·8	10·5	9·1	..	14·0	11·9	9·7	..		..
Metal employed or system of construction	Steel Jacket and Hoops.		Steel-hooped.			Steel Tube and Wrought Iron.			Bronze.		

NOTE.—The 23-cm. guns also discharge 113-Kg. steel shells and 113-Kg. solid shot. The 18-cm. guns discharge steel shells of 51-Kg. and segment shells of 53-Kg. The 7·5-cm. guns discharge ring-shells of 4·3 Kg. Of the older guns there are yet extant three sorts—rifled 16-cm. muzzle-loader (mostly bronze), rifled bronze 7-cm. and 5-cm.

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FRENCH NAVAL ORDNANCE.

Date and Pattern of Gun.	1870–81.	70–81. 70–84.	81–84.	1884.				1881.									
								34 long.	34 short.	27	24	16 heavy.	16 light.	14	10	mm. 90	mm. 65
Desig. by Calibre, in cms. . .	27	32	14	34	27	24	16										
Calibre, in inches . . .	10·80	12·6	5·46	13·39	10·80	9·45	6·49	13·39	13·39	10·8	9·45	6·49	6·49	5·46	3·94	3·54	2·57
Total length, in feet . . .	23·97	28·01	13·64	..	28·47	24·89	17·04	33·69	25·32	27·12	23·70	15·14	15·14	14·3	8·6	7·1	3·58
Length of Bore, in inches . .	269·0	318·8	..	..	..	..	..	380·6	280·2	306 9	269·3	180·9	180·9	162·6	102·6	77·9	41·2
Length of Bore, in calibres . .	24·9	24·9	..	30	30	30	30	28·4	21·0	28·5	28·5	28·5	28·5	30	26	22	16
Number of Grooves . . .	..	..	..	..	..	..	..	..	..	..	..	50	50	42	30	28	20
Depth of Grooves, inches . .	0·059	0·059	..	..	..	..	..	0·067	0·067	0·059	0·055	0·039	0·039	0·035	0·028	0·024	0·020
Rifling Twist	70	70	..	..	..	..	..	70	70	70	70	7°	7°	7°	7°	7°	8°
Total weight, in tons . . .	24·6	41·3	32·0	51·18	27·6	17·91	49·2	52·2	47·2	27·4	17·7	4·9	3·9	3·2	1·18	0·54	0·09
Weight of Firing Charge — Armour Piercing Projectile . . lbs.	154·3	249·1	27·1	..	203·9	..	42·5	..	368·2	203·9	149·9	42·5	32·6	..	..	..	..
Weight of Firing Charge — Common Shell „	154·3	249·1	27·1	..	203·9	..	42·5	..	368·2	203·9	149·9	42·5	32·6	27·1	9·9	3·6	0·95
Weight — Armour Piercing Projectile* . . lbs.	476·2	760·6	66·14	925·9	476·2	317·5	99·2	925·9	925·9	476·2	317·5	99·2	99·2	..	..	..	..
Weight — Common Shell . „	396·8	630·5	66·14	771·6	396·8	264·6	99·2	771·6	771·6	396·8	264·6	99·2	99·2	66·1	30·9	17·6	5·95
Weight — Case Shot . „	..	..	..	..	..	..	..	..	..	..	..	..	..	61·7	39·0	19·5	7·7
Muzzle Velocity, in feet, sec. .	1887	1804	1936	2133	2067	2067	1969	2001	1804	2034	2034	1969	1821	1936	1673	1493	1135
Muzzle Energy — Total, in foot-tons . .	11760	17160	1719	29180	14110	9410	2668	26440	20880	13660	9107	2668	2080	..	..	..	..
Muzzle Energy — Per in. circ., foot-tons .	346·6	433·5	100·2	693·7	397·3	317·1	130·8	628·8	496·6	402·6	308·4	130·9	121·3	..	..	..	..
Perforation at Muzzle, inches .	19·5	21·71	10·5	27·62	20·9	18·7	12·0	26·3	23·2	21·38	18·4	12·0	11·5	..	..	..	..

* Steel or chilled iron.

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FRENCH NAVAL ORDNANCE—*continued.*

Date and Pattern of Gun.	75-79.	Jacketed. 1870.			Jacketed. 70-75	Jacketed. 75	1875.					1870.					
Desig. by Calibre, in cms.	37	32	27	14	27 No. 1	10	42†	34	27 No. 1	27 No. 2	10	32 long.	27	24	19 long.	16	14
Calibre, in inches	14·57	12·6	10·79	5·46	10·8	3 94	16·54	13·39	10·8	10·8	3·91	12·6	10·8	9·45	7·64	6·49	5·46
Total length, in feet	36·7	22·0	17·7	10·3	19·3	9·3	32·5	22	19·3	19·3	9·3	22·0	17·7	16·21	13·6	12·2	10·3
Length of Bore, in inches	414·0	243·6	194·3	115·0	213·4	104·3	366·0	241·5	213·4	214·8	104·3	243·6	194·3	179·1	151·0	137·3	115·0
Length of Bore, in calibres	28·4	19·5	18	21·1	19·8	26·5	22·1‡	18	19·8	19·9	26·5	19·5	18·0	18·1	19·8	21·2	21·1
Number of Grooves	..	64	54	28	54	20	84	68	54	42	20	64	54	48	28	50	28
Depth of Grooves, inches	0·079	0·059	0·059	0·047	0·059	0·032	0·079	0·059	0·059	0·059	0·032	0·059	0·059	0·059	0·059	0·039	0·047
Rifling Twist	7°	4°	4°	4°	4°	7°	7°	4°	4°	4°	7°	4°	4°	4°	4°	7°	4°
Total weight, in tons	75·1	38·8	22·8	2·6	27·9	1·18	74·8	47·6	27·6	24·4	1·18	38·4	22·8	15·4	7·9	4·92	2·66
Weight of Firing Charge — Armour Piercing Projectile * lbs.	463	189·6	136·7	..	165·3	..	604·1	257·9	136·7	103·6	..	151·0	92·6	62·8	33·1	39·7	..
Weight of Firing Charge — Common Shell „	463	196·2	126·8	13·6	145·5	10·1	..	231·5	121·3	103·6	7·1	151·0	92·6	62·8	33·1	39·7	9·0
Weight — Armour Piercing Projectile lbs.	1235	760·6	476·2	..	476·2	..	1719·6	925·9	476·2	476·2	..	760·6	476·2	317·5	165·3	99·2	..
Weight — Common Shell „	1014	631·6	396·8	61·7	396·8	30·9	1433·0	771·6	396·8	396·8	26·3	631·6	396·8	264·6	137·8	99·2	46·3
Weight — Case Shot „	..	..	321·9	42·8	321·9	18·7	..	..	321·9	321·9	18·7	..	321·9	211·6	..	68·3	39·7
Muzzle Velocity, in feet, sec.	1969	1543	1575	1529	1736	1673	1739	1595	1641	1542	1591	1437	1424	1444	1470	1782	1493
Muzzle Energy — Total, in foot-tons	33210	12590	8193	..	9942	..	36040	16320	8865	7852	..	10880	6695	4592	2477	2183	..
Muzzle Energy — Per in. circ., foot-tons	725·4	318	242	..	293	..	695·5	388	261	231·5	..	275	197·3	154·7	103·2	107	..
Perforation at Muzzle, inches	28·2	18·3	16·0	..	17·8	..	27·4	20·3	16·7	15·6	..	16·9	20·53	20·3	10·4	10·8	..

* Steel or chilled iron.

† There is also a 42-cm. gun of 20·35 calibres length, in 2 pieces.

‡ Chilled or steel.

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GERMAN NAVAL ORDNANCE.

	Krupp Steel Breech-loading Guns, designated by calibre.																							Bronze B.L.
Designation in centimètres	30·5 jack'd.	26 long.	26 jack'd.	26 short.	24 long.	24 short.	21 long.	21 long.	21 short.	21 short.	17 long.	17 short.	15 long.	15 short jack'd.	15 short.	15 short.	15 short jack'd.	15 short jack'd.	12·5 hoop'd.	12 hoop'd.	10·5 long.	8·7	8	8	8
Calibre, in inches	12·01	10·33	10·33	10·33	9·45	9·37	8·24	8·24	8·24	8·24	6·80	6·80	5·87	5·87	5·87	5·87	5·87	5·87	4·92	4·74	3·96	3·43	3·09	3·09	3·19
Length — Total, in feet	21·98	18·77	18·77	17·06	23·63	15·45	24·0	20·61	15·45	12·88	13·94	11·32	14·67	10·73	10·73	10·73	10·68	10·68	9·60	9·6	12·08	6·89	6·89	6·89	5·15
Length — Rifled portion, in ins.	181·9	149·8	150·0	129·3	201·6	116·2	218·2	176·5	124·6	114·9	117·1	102·2	128·5	93·3	87·1	86·7	87·1	86·7	85·7	85·3	113·6	62·7	57·6	57·6	45·9
Length — Powder Chamber†,,	45·3	44·7	44·4	44·7	53·5	40·9	75·3	46·7	37·1	34·0	31·5	16·7	31·1	19·0	25·1	25·5	25·1	25·5	16·7	16·7	19·5	10·7	10·5	10·5	9·73
Length — Bore, in calibres	18·9	18·8	18·8	16·8	26·1	16·8	35·6	27·1	19·6	18·1	21·9	17·5	27·2	19·1	19·1	19·1	19·1	19·1	20·8	21·6	33·6	21·4	22·0	22·0	17·4
Number of Grooves	72	36	48	36	56	48	48	48	30	30	30	30	36	36	36	24	36	24	32	18	32	24	12	12	12
Depth of Grooves, in inches	0·079	0·077	0·079	0·077	0·059	0·061	0·059	0·059	0·102	0·102	0·063	0·063	0·059	0·061	0·061	0·061	0·061	0·061	0·059	0·051	0·049	0·049	0·049	0·049	0·051
Twist, in calibres	45	50	50	50	25*	45	25*	25*	68	59	45	45*	25*	45	45	68	50	65	40*	60	25*	40*	46	46	46
Weight — Gun, including Breech Gear, tons	35·4	21·7	18·7	17·7	18·7	14·6	13·03	12·3	9·84	8·86	5·51	3·40	4·04	3·44	3·44	3·44	3·15	3·15	1·38	1·35	1·15	0·44	0·32	0·29	0·23
Weight — Breech Block, in lbs.	2954	2050	1973	1973	..	1378	831·1	908·3	831·1	831·1	496·0	414·5	390·2	324·1	324·1	324·1	324·1	381·4	163·1	163·1	149·9	86·0	63·9	63·9	55·1
Weight — Armour-piercing projectile,‡ in lbs.	725·3	412·3	412·3	412·3	474·0	306·4	308·6	308·6	217·2	217·2	117·9	117·9	112·4	76·1	76·1	76·1	76·1	78·3	..	..	..	..	..	..	..
Weight — Common Shell, in lbs.	725·3	357·1	357·1	357·1	474·0	261·5	308·6	308·6	174·2	174·2	112·9	112·9	112·4	65·0	65·0	65·0	65·0	61·1	40·1	33·1	39·7	14·9	9·4	9·4	8·3
Weight of Bursting Charge — Armour-piercing Shell, in lbs.	7·7	5·3	5·3	5·3	6·6	3·2	5·5	5·5	2·8	2·8	1·3	1·3	1·5	0·8	0·8	0·8	0·8	..	..	..	..	..	..	..	..
Weight of Bursting Charge — Common Shell, in lbs.	19·8	14·3	14·3	22·0	15·4	15·4	12·1	12·1	6·6	6·6	5·1	5·1	4·3	4·2	4·2	4·2	4·2	..	2·4	2·5	0·9	0·4	0·4	0·6	0·6
Weight of Firing Charge — Armour-piercing Shell, in lbs.	202·8	105·8	105·8	125·7	152·1	67·2	103·6	103·6	41·9	35·3	30·9	16·5	33·1	14·3	17·1	13·2	17·1	13·2	..	..	..	..	..	..	..
Weight of Firing Charge — Common Shell, in lbs.	202·8	105·8	105·8	125·7	152.1	50·7	103·6	103·6	41·9	35·3	30·9	16·5	33·1	14·3	17·1	12·1	17·1	12·1	8·8	4·6	8·8	3·3	1·1	1·1	0·9
Initial Velocity — Armour-piercing projectile, ft.-sec.	1718	1588	1588	1578	1657	1493	1739	1657	1463	1316	1608	1326	1624	1463	1463	1358	1463	1358	..	...	..	..	..	..	..
Initial Velocity — Common shell, ft.-sec.	1713	1641	1641	1654	1657	1391	1739	1657	1394	1276	1654	1342	1624	1555	1555	1447	1555	1447	1545	1280	1526	1545	1148	1119	1053
Muzzle Energy — Total, foot-tons	14,740	7211	7211	7119	9024	4736	6471	5876	3225	2606	2112	1436	2055	1131	1131	974	1131	1002	..	..	..	..	..	..	..
Muzzle Energy — Per in. circ., ft.-tons	391	223	223	220	304	161	250·0	227	125	101	98·9	67·3	111·5	61·3	61·3	52·8	61·3	54·3	..	..	..	..	..	..	..
Perforation at Muzzle, in ins.	20·5	15·4	15·4	15·3	18·1	13·0	16·4	15·6	11·4	10·1	10·3	8·3	11·0	8·0	8·0	7·4	8·0	7·5	..	..	..	..	..	..	..

NOTE.—See two 40-cm. Krupp L.S. guns, given on General Maitland's Table, p. 357, *Annual* 1886, and one in the *Naval Annual* for 1890, p. 365, viz. 119 tons weight. The 30·5, 26, and 24-cm. guns fire steel armour-piercing projectiles.

* Maximum twist.

† Including taper entrance into bore.

‡ In most cases steel shells.

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ITALIAN NAVAL ORDNANCE.

	Armstrong Breech Loading.				B.L.	Armstrong Muzzle Loading.							Muzzle Loading. Old Pattern.		Breech Loading.	
Designation by Calibre, in centimètres	43‡ New Pattern.	43‡ Early Pattern. 1882.	15†	12*	12	45	28 New Pattern.	25 No. 1 Long.	25 No. 2 Short.	25 No. 2.	22	20	16	16	7·5 No. 1.	7·5 No. 2.
Calibre, in inches	17	17	5·91	4·72	4·7	17·72	11	10	10	10	9	8	6·5	6·5	3	3
Length — Total, in feet	40·75	39	13·8	8·5	9·25	32·7	14·4	14·4	14	13·8	13·8	10·8	11·8	10·6	5·8	3·3
Length — Rifled Bore, in inches	346·8	315·7	126	75	88	302	121	120	114	112	106	89	96	87	52	27
Length — Powder Chamber, in inches	84·5	98	28	10·8	22	56·5	24·5	26·0	26·0	14·0	19·5	15·7	21·3	21·3	10·2	7·9
Length — Bore, in Calibres	27	26	26	20·2	23·5	20·5	13·2	14·6	14·0	12·6	13·9	13·1	16·8	15·5	20·7	11·7
No. of Grooves	82	82	28	37	36	28	9	7	7	8	6	6	6	6	12	12
Twist of Rifling, in Calibres	50	50	40	40	42	50	35	40	40	55	45	45	42·5	27·3	48	48
Total Weight, in tons	104·3	101·5	4	1·21	1·38	100	25·0	18·0	18·0	12·1	12·6	7·02	5·12	3·54	0·29	0·095
Firing Charge — Armour-piercing projectile, in lbs.	900·0	725	34	..	..	551	94·8	77·2		63·9	50·0	35·0	19·8	..	..	..
Firing Charge — Common Shell, „	600	480	25	5·5	9·3	440·9	66·1	52·9		41·9	33·0	21·0	7·1	7·1	1·9	0·7
Weight — Armour-piercing projectile, „	2000	2000	80	..	..	2000	560·0	451·9		331·8	250·0	180·0	101·4	..	..	..
Weight — Common Shell, „	2000	2000	80	32·4	36·4	2000	533·5	399·0		284·4	250·0	180·0	66·1		91·7	93·0
Weight — Shrapnel „	2000	2000	80	34·4	37·37	2000	533·5	399·0		284·4	250·0	180·0	66·1		91·7	93·0
Weight — Case Shot „	2000	2000	70	23·5	35·9	2000	200·1	188·1		135·6	99·6	79·4	33·1		64·6	64·6
Bursting Charge — Armour-piercing projectile, „	32	32	1·5	..	..	32	15·0	11·1		8·4	6·3	3·6	..		..	..
Bursting Charge — Common Shell, „	60	60	5	3·1	2·2	78	26·0	23·8		18·2	18·8	9·7	2·8		0·3	0·4
Bursting Charge — Shrapnel „	5	5	0·16	0·28	0·35	5	2·2	1·85		1·96	1·48	0·71	0·50		0·02	0·02
Muzzle Velocity, in feet	1992	1935	1946	1345	1591	1700	1329	1388		1373	1442	1353	1303	1024	1335	..
Muzzle Energy — Total, foot-tons	55,030	51,930	2100	..	..	40,060	6859	6035		4369	36,040	22,850	1195	..	..	..
Muzzle Energy — Per inch circumference, foot-tons	1035	976·3	114·1	..	..	753·4	198·6	192·2		139·1	128·6	99·8	54·4	..	..	..
Perforation at Muzzle, inches	33·7	32·8	11·2	..	..	28·5	14·2	14·1		12·0	11·5	10·1	7·5	..	..	..
Metal employed in structure.	St.	I. & St.	St.	St.	St.	Steel tube in Wrought Iron jacket.							I. & St.	Cast I.	Br.	Br.

St. stands for steel, I. for iron, Br. for Bronze.

* 120-mm. army shot, besides which there exist 120-mm. quick-firing guns, L. 40 (Piemonte), L. 33 (Duilio, Dandolo, Formidabile). † There exist 152-mm. cannons (Armstrong and bronze-bore) with metal cartridges (Piemonte, Fieramosca, Re Umberto, Ancona, Doria). There are also two kinds of 149-mm. bore, and two, one short and one long; also a new bore for metal cartridges (Italia). ‡ There are four types of these bores, viz.: types Lauria, Lepanto, Italia, Valente.

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RUSSIAN NAVAL ORDNANCE.

	Obuchoff Steel Breech Loading Hooped Guns.															Steel B.L. Guns.		
Designation by Calibre, in inches	12	12 Long.	12 M. 77.	11 M. 67.	11 Pattern 77.	9	9 M. 67.	9	8	8	8 M. 67.	6	6 Long.	6·03	6	Long 9-pdr.	4·2 (9-pdr.)	3·43 Long (4-pdr.)	3·43 (4-pdr.)
Calibre in centimètres	30·48	30·48	30·48	27·94	27·94	22·86	22·86	22·86	20·32	20·32	20·32	15·24	15·24	15·32	15·24	10·67	10·67	8·70	8·70
Total Length, in feet	**35	30	20	18·3	20·0	**26·25	15·0	13	**23·33	**20	14·6	**17·5	14	12·2	11·7	6·9	7·0	6·9	5·8
Length of Rifled Portion of Bore, in inches	..	..	165·0	152·0	158·0	..	124·0	..	..	..	128·0	..	118·7	106·0	98·0	61·5	65·0	62·6	53·0
Length of Powder Chamber, in inches	..	..	38·5	35·0	50·4	..	28·5	..	..	..	23·0	..	30·5	22·4	22·2	10·5	8·0	10·7	..
Length of Bore in calibres, including Powder Chamber	**35	..	17	17	18·9	**35	16·9	..	**35	**30	18·9	**35	24·9	21·3	20	17·1	17·4	21·4	..
Number of Grooves, in inches	..	..	36	36	64	..	32	32	..	..	30	..	..	24	24	24	16	24	12
Depth of Grooves „	..	0·070	0·135	0·135	0·135	..	0·110	0·110	..	..	0·090	..	0·060	0·085	0·070	0·055	0·055	0·050	0·050
Twist of Rifling in calibres	..	..	73·5	70	..	..	60	60	..	..	70	..	*24	60	68	*40	50	40	41
Total Weight, in tons	55·7	50·45	39·9	28·2	28·2	19·44	15·0	12·5	13·64	12·74	9·67	6·26	4·08	4·35	4·03	0·60	0·87	0·45	0·35
Weight of Steel Shell, in lbs.	..	..	665·8	515·9	..	..	249·1	275·6	..	..	172·0	..	90·9	97·6	86·0	..	..	..	..
Weight of Chilled Shell, „	..	731·9	665·8	515·9	562·2	..	275·6	264·7	..	193·1	169·8	..	119·0	86 0	86·0	..	..	..	..
Weight of Common Shell, „	626·4	..	639·3	496·0	520·3	268·2	266·8	266·8	192·3	172·4	172·0	73·35	..	81·6	81·6	27·6	24·2	15·2	12·6
Weight of Case Shot, „	..	..	293·2	216·1	..	..	176·4	176·4	..	..	134·5	..	..	57·3	57·3	27·6	22·3	15·2	11·0
Weight of Firing Charge. Steel Shell, „	..	..	144·4	115·3	..	..	64·2	47·0	..	..	31·5	89·38	..	14·3	18·1	..	..	..	..
Weight of Firing Charge. Chilled Shell, „	..	246·9	144·6	90·6	132·2	..	47·0	47·0	..	72·0	29·3	39·6	37·8	14·3	18·1	..	..	..	..
Weight of Firing Charge. Common Shell, „	..	..	117·3	81·6	132·2	180	42·1	42·1	88·2	72·0	28·4	39·6	..	10·8	14·3	4·5	2·6	3·1	1·3
Muzzle Velocity, in feet	..	1942	1470	1486	1516	2376	1463	1260	1925	1796	1352	2080	‡1739	1206	1463	1225	..	1444	..
Muzzle Energy Total, foot-tons	..	19140	9974	7903	8960	10500	4095	3035	..	4321	2180	2682	1905	982	1276	..	..	..	..
Muzzle Energy Per Inch Circumference, foot-tons	..	508·4	264·6	228·8	259·3	371·4	144·7	107·4	..	172·0	86·7	142·3	101·1	51·8	67·74	..	..	..	..
Perforation † at Muzzle, in inches	..	23·6	16·7	15·5	16·5	20·2	12·3	10·5	..	13·5	9·5	12·50	10·5	7·2	8·4	..	..	..	..

** It is doubtful if this refers to the total length of gun or of bore. * Maximum of increasing twist. † Through iron unbacked.
‡ With pyroxiline.

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SPANISH NAVAL ORDNANCE.

	Hontoria, New Pattern.					Hontoria, Pattern 83.							Armstrong, Pattern 83.						Armstrong.			Krupp.			
	Breech Loading.					Breech Loading.													Muzzle Loading.		Pattrn 81 B.L.	Breech Loading.			
Designation by Calibre	16-cm. No. 1.	16-cm.	12-cm.	9-cm.	7-cm.	32-cm.	28-cm.	24-cm.	20-cm.	16-cm.	14-cm	12-cm.	24-cm.	20·3-cm	15-cm.	12-cm.	8·4-cm	7·5-cm long.	22·86-cm	20·3-cm	6-in.	15-cm	12-cm.	8·7-cm	7·5-cm
Calibre, in inches	6·34	6·34	4·72	3·54	2·76	12·60	11·02	9·45	7·87	6·34	5·51	4·72	9·449	8·00	6·00	4·72	3·3	2·95	9·00	8·00	6·00	5·87	4·72	3·43	2·95
Length — Total length, in feet	13·8	9·63	10·4	7·8	3·7	38·7	33·8	..	..	19·3	16·91	14·5	29	18·4	17·00	13·75	7·9	7·51	13·0	11·9	14·5	17·13	11·81	6·9	6·3
Length — Rifled Portion, in inches	125·6	89·8	94·5	70·9	35·4	352·4	309·1	..	..	170·9	149·0	135·8	260·2	162·0	158·3	135·8	75·0	70·7	104·0	102·0	126·9	..	..	..	57·6
Length — Powder Chamber, in inches	31·9	17·3	23·8	17·7	6·1	86·8	77·1	..	..	49·8	43.1	39·4	66·9	43·5	31·4	19	13	13	..	..	29·7	..	..	..	..
Length — Bore, in calibres.	25	16·9	25	25	15	36*	36*	..	..	36*	37	37*	35	26	32	33	27	28·7	14	14·75	26·1	35*	30*	24*	25·8*
No. of Grooves	38	38	30	22	18	80	70	60	50	40	35	30	60	33	28	22	20	18	6	4	28	36	32	24	24
Depth of Grooves, in inches.	0·06	0·06	0·05	0·05	0·05	0·06	0·06	0·06	0·06	0·06	0·04	0·05	0·05	0·03	0·037	0·03	0·03	0·03	0·18	0·18	..	0·06	0·06	0·05	0·05
Twist of Rifling, in calibres.	Increasing from 100 to 49.	56	Increasing from 100 to 40.			From 0 to 30.							30	45	30	40	30	35	45	40	100 to 40	25	25	40	36
Total Weight, in tons	5·6	2·71	1·4	0·59	0·10	49·2	32·5	19·8	11·5	6·1	4·1	2·6	21	11·5	5·0	2·2	0·45	0·35	12·5	9·0	4·0	4·6	2·1	0·49	0·30
Weight — Armour-piercing projectile, in lbs.	93·7	..	..	..	..	1058	705·5	436·5	253·5	132·3	88·2	55·1	445	180	100·0	40·0	..	..	2500	180·0	78·0	85·10	43·65	..	..
Weight — Common Shell, in lbs.	83·8	63·9	36·2	15·4	7·28	1058	705·5	..	..	116·8	88·2	49·6	393	180	100·0	40·0	15·0	12·0	2500	180·0	83·6	65·70	34·61	14·6	9·48
Weight — Ring Segment, in lbs.	83·8	..	33·1	17·0	7·9	..	..	..	..	116·8	..	49·6	..	..	..	40·0	15·0	12·0	..	..	..	..	34·61	14·6	9·04
Firing Charge — Armour-piercing projectile, in lbs.	26·5	..	..	..	..	529·1	352·7	220·5	127·9	..	44·1	28·7	220	90	55·0	16·0	..	..	50·0	35·0	34·0	37·48	19·29	..	..
Firing Charge — Other projectiles	24·3	15·4	13·2	6·28	0·99	..	..	..	..	..	..	..	145	65	34·0	12·0	4·0	3·75	33·0	21·0	39·0	..	..	10·3	10·4
Muzzle Velocity, in feet	1631	1493	1749	1837	1037	2051†	2034†	2034†	..	..	..	1988	1950	2020	2070	2000	1625	1709	..	..	1936	2182	2034	1539	1542
Muzzle Energy — Total, in foot-tons	1729	988	702	..	..	30870	20230	12520	..	..	..	1511	11730	5094	2972	1109	275	243	..	..	2173	2809	1252	..	..
Muzzle Energy — Per inch circumference, foot-tons	87·4	..	..	..	..	779·8	584·5	421·8	..	..	..	101·9	397·4	203·8	156·4	75·15	..	..	..	..	..	152·4	84·45	..	..
Perforation at Muzzle, in inches	9·6	..	..	..	..	29·3	28·4	21·5	..	..	..	10·5	20·9	15·0	13·22	9·09	..	..	..	..	..	12·9	9·63	..	..
Metal and Construction	St. & Cast I.		St. Hoop'd.		St.	St. Jacket and Hoops.							St.						St. and Wt. I.		St.	St.			

18 and 16-cm. Palliser guns and 16 and 13-cm. Parrot guns also exist. St. stands for Steel; I. for Iron. Three new 18-cm. (7·09 in.) guns exist of 86·6, 78·7, and 60·0 tons firing respectively projectiles of 187·4, 135·6, and 135·6 lbs. The first has a charge of 94·8 lbs., and muzzle velocity of 2034 feet, muzzle energy of 5374 foot-tons, and 241·3 foot-tons per inch, and a perforation of 16·3 in. of iron. * Total length, the length of bore not being supplied. † These figures are probably estimated, and the power of the guns so great as to be out of the question; compare with British, French or German guns, and the mistake is apparent.

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NAVAL ORDNANCE OF SWEDEN AND NORWAY.

	Sweden.													Norway.‡								
	Breech Loaders.			Model 76.		M. 79.	Model 81.		Model 83.		M. 85.	M. 86.	M.L.	Krupp, Hooped B.L.			Armstrong, M.L.				Palliser, M.L.		Cast-iron, M.L.
Designation by Calibre	27-cm.	24-cm.	17 cm.	27-cm.	24-cm.	12-cm.	27-cm.	12-cm.	15-cm.	8-cm.	25-cm.	65-mm	12-cm.	26-cm.	15-cm.	12-cm.	8¼-in.	8¼-in.	8¼-in.	6¼-in.	5¼-in.	5-in.	5-in.
Calibre, inches	10·80	9·45	6·58	10·80	9·45	4·72	10·80	4·72	6·00	3·31	10·00	2·60	4·80	10·24	5·91	4·72	10·51	10·51	10·51	7·88	6·58	6·11	6·11
Total Length, feet	17·46	14·96	11·27	17·65	16·24	10·32	23·10	10·29	13·87	7·37	28·33	3·79	8·87	18·77	12·63	..	16·87	14·66	13·49	10·82	11·58	10·30	11·21
Length — Rifled Portion of Bore, ins.	156·1	134·9	106·3	159·6	150·9	94·5	191·8	94·5	124·5	71·5	274·4	35·1	83·3	160·4	112·4	..	137·3	121·0	110·6	85·7	92·4	91·7	101·6
Length — Chamber, „	30·0	26·7	16·8	32·3	28·1	19·9	65·8	20·6	29·5	9·0	55·0	5·0	13·6	34·1	22·6	..	38·2	24·0	20·5	18·5	19·3	10·8	14·5
Length — Bore in calibres, „	17·2	17·1	18·7	17·8	18·9	23·8	23·9	24·0	25·7	24·3	32·9	15·4	20·2	19·0	22·8	..	16·7	13·8	12·5	13·2	17·0	16·8	19·0
Number of Grooves	5	5	5	42	36	30	45	30	28	24	42	26	8	60	36	..	8	8	8	6	3	3	3
Twist of Rifling	30*	30*	30*	45*	..	30*	40*	30*	30	33*	40*	..	40	45	45	..	55	55	55	50	34	34	34
Total Weight, tons	23·6	14·4	5·2	23·6	16·4	2·5	27·1	1·9	4·2	4·2	29·8	9·4	1·9	21·7	3·9	13·8	21·4	19·5	18·1	7·5	4·8	3·4	2·9
Weight of — Chilled Shell, lbs.	476·2†	317·5†	107·1†	476·2†	317·5†	..	476·2†	..	100·0	..	449·7	..	..	463·0	86·0	44·1	447·5	385·8	385·8	153·2	110·2	..	..
Weight of — Common Shell, „	396·8	224·9	97·7	396·8	273·4	48·5	396·8	48·5	100·0	14·8	401·2	6·0	34·6	381·4	69·4	44·1	308·6	308·6	308·6	148·8	82·7	59·1	59·1
Weight of Firing Charge — Chilled Shell, lbs.	83·8	59·5	22·0	90·4	56·2	..	206·4	..	35·3	..	242·5	..	..	99·2	18·7	9·9	121·3	71·7	66·1	29·7	22·0	..	..
Weight of Firing Charge — Common Shell, „	83·8	59·5	22·0	90·4	56·2	13·8	145·5	16·0	35·3	3·3	242·5	0·9	6·6	81·6	18·7	9·9	77·2	38·6	38·6	19·8	11·0	7·17	7·17
Muzzle Velocity, feet.	1322	1312	1365	1378	1365	1476	1788	1640	1663	1542	2100	1148	..	1575	1575	1493	1555	1378	1296	1296	1329	..	..
Total foot-tons	5771	3789	1384	6272	4102	..	10550	..	1918	..	13750	..	..	7966	1479	680	7502	5082	4495	1785	1350	..	..
Muzzle Energy — Per inch Circumference.	170·1	127·6	66·9	184·9	138·2	..	311·3	..	101·7	..	437·7	..	..	247·7	79·7	45·9	227·3	153·9	136·1	72·1	65·3	..	..
Muzzle Energy — Perforation through Iron	13·19	11·4	8·3	13·8	11·9	..	18·4	..	10·4	..	21·9	..	..	16·2	9·2	7·0	15·6	12·6	11·8	8·6	8·2	..	..

Sweden.—The breech-loaders have breech screw-stoppers. The whole of the guns also discharge case-shot, and the 12-cm. discharge also shrapnel.
Norway.—Besides the chilled shell, there are also chilled solid shot for the 8·5-in. and the 6·5-in. guns, and for all muzzle-loaders case-shot also.
* Maximum rate of increasing twist. † Solid shot. ‡ Newest designs for Norway not known.

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*UNITED STATES NAVAL ORDNANCE.

Forged Steel, built up B.-L. Guns.

NAME OF GUN.	Calibre.	Length of Gun.					Twist of Rifling.	Total Weight.	Weight of Projectiles.		Charge.		Initial Velocity.	Muzzle Energy.	Perforation of Wrought Iron at Muzzle.
		Total Length.	Length of Bore.		Rifled Portion.	Powder Chamber.			Armour Piercing.	Common.	Firing.	Bursting.			
	inch.	inch.	inch.	Cal.	inch.	inch.		tons.	lbs.	lbs.	lbs.	lbs. or oz.	ft. per sec.	ft.-tons.	inch.
FINISHED.															
5-in. B.L.R. †	5	160·0	150·0	30·0	120·45	29·2	1 turn in 25 or 30 cals.§	2·59	60	60	31	3	2000	1,664	10·8
6-in. B.L.R.	6	220	210·0	35·0	167·54	40·49		4·58	100	100	50	6	2100	3,058	13·4
8-in. B.L.R.	8	296·0	280·0	35·0	230·72	49·61		12·53	250	250	113	13	2100	7,643	18·2
8-in. B.L.R.‡	8	336	320·0	40·0	..	..		..	..	..	..	..	..	..	..
10-in. B.L.R.	10	318·88	300·0	30·0	236·06	60·96		26	500	500	250	22	2000	13,870	22·0
UNDER CONSTRUCTION.															
10½-in. B.L.R.	10½	386·1	367·5	35·0	299·7	69·0		28·55	550	550	275	24	2100	16,820	23·7
12-in. B.L.R.	12	422·6	420·0	35·0	319·81	79·31		44·0	850	850	425	38	2100	25,990	27·5
13-in. B.L.R.	13	..	455·0	35	..	..		..	..	..	..	..	..	..	..

* This table was originally based on the U.S. estimated figures. Some corrections have been furnished by Major Post, U.S. Military Attaché, others are altered to correspond approximately. Most of the data are not settled sufficiently to admit of an authoritative table being furnished. † There is also a 5-in. Q.F. gun.
‡ One turn in 25 calibres rifling. § Rifling polygroove, increasing twist. Generally from 1 in 180 to 1 in 25 or 30 calibres near the muzzle, then uniform.

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Table Relating to Conversion of Measures.

Length.

Metric to English. | English to Metric.

I. Mètres.	II. Yards.	III. Feet.	IV. Inches.	V. Yards.	VI. Mètres.	VII. Feet.	VIII. Mètres.	IX. Inches.	X. Centimètres.
1	1·0936	3·2809	39·37	1	0·91438	1	0·30479	1	2·5400
2	2·1873	6·5618	78·74	2	1·82877	2	0·60959	2	5·0799
3	3·2809	9·8427	118·11	3	2·74315	3	0·91438	3	7·6199
4	4·3745	13·1236	157·48	4	3·65753	4	1·21918	4	10·1598
5	5·4682	16·4045	196·85	5	4·57192	5	1·52397	5	12·6998
6	6·5618	19·6854	236·22	6	5·48630	6	1·82877	6	15·2397
7	7·6554	22·9663	275·60	7	6·40068	7	2·13356	7	17·7797
8	8·7491	26·2472	314·97	8	7·31507	8	2·43836	8	20·3196
9	9·8427	29·5281	354·34	9	8·22945	9	2·74315	9	22·8596

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of yards in 2354 mètres (see cols. I. & II.).	of feet in 12·4 mètres (see cols. I. & III.).	of inches in 30·5 centimètres (see cols. I. & IV.). Note, 1 m.=100 cm.	of mètres in 1026 yards (see cols. V. & VI.).	of mètres in 1742 feet (see cols. VII. & VIII.).	of centimètres in 17·72 ins. (see cols. IX. & X.)
mètres. yards.	mètres. feet.	cms. inches.	yards. mètres.	feet. mètres.	inches. cms.
2000=2187·3	10 =32·809	30·0=11·811	1000=914·38	1000=304·79	10·0 =25·400
300= 328·09	2 = 6·562	20= 18·29	700=213·36	40= 12·19	7·0 =17·780
50= 54·68	0·4= 1·312	·5= ·197	40= 36·58	2= 0·61	0·7 = 1·778
4= 4·37			6= 5·49	·2= ·051	·02= ·051
∴ 2354=2574·44	∴ 12·4=40·683	∴ 30·5=12·008	∴ 1026=938·16	∴ 1742=530·95	∴ 17·72=45·009

Note.—A ready way of approximately converting all French measures into English inches is to multiply by 4 and apply the decimal point by common sense—Thus for a 15-cm. gun; 15 × 4 = 60. Now this Calibre cannot be 60 inches, nor can it be 0·6 inches; therefore it must be 6 inches. (The exact value is 5·906 in.)

Weight.

Metric to English. | English to Metric.

I. Kilogrammes.	II. Tons.	III. Pounds Avoirdupois.	IV. Grains Troy.	V. Tons.	VI. Milliers.	VII. Pounds Avoirdupois.	VIII. Kilogrammes.	IX. Grains. Troy.	X. Gramme.
1	·000984	2·2046	15432·3	1	1·016	1	0·4536	1	·0648
2	·001968	4·4092	30864·7	2	2·032	2	0·9072	2	·1296
3	·002953	6·6139	46297·0	3	3·048	3	1·3608	3	·1944
4	·003937	8·8185	61729·4	4	4·064	4	1·8144	4	·2592
5	·004921	11·0231	77161·7	5	5·080	5	2·2680	5	·3240
6	·005905	13·2277	92594·1	6	6·096	6	2·7216	6	·3888
7	·006889	15·4323	108026·4	7	7·112	7	3·1751	7	·4536
8	·007874	17·6370	123458·8	8	8·128	8	3·6287	8	·5184
9	·008858	19·8416	138891·1	9	9·144	9	4·0823	9	·5832

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of tons in 35 milliers (see cols. I. & II. Note, 1000 kg. =1 millier).	of pounds in 56·3 kilogrammes. (see cols. I. & III.).	of grains in 120 grammes (see cols. I. & IV. Note, 1000 grms. = 1 kg.)	of milliers in 38 tons (see cols. V. & VI.).	of kilogrammes in 68 pounds (see cols. VII. & VIII.).	of grammes in 85 grains (see cols. IX. & X.).
milliers. tons.	kgrms. lbs.	grammes. grains.	tons. milliers.	lbs. kgs.	grains. grammes.
30 = 29·53	50 =110·231	100=1543·23	30 = 30·48	60 = 27·216	80 = 5·184
5 = 4·92	6 = 13·228	20= 308·65	8 = 8·13	8 = 3·629	5 = 0·324
	0·3= ·661				
∴ 35 = 34·45	∴ 56·3=124·120	∴ 120=1851·88	∴ 38 = 38·61	∴ 68 = 30·845	∴ 85 = 5·508

Note.—7000 grains troy=1 pound avoirdupois.

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PRESSURE.

Metric to English.			English to Metric.				Atmospheric to English.		English to Atmospheric.	
I. Kilogrammes per square centimètre.	II. Pounds per square inch.	III. Tons per square inch.	IV. Pounds per square inch.	V. Kilogrammes per square centimètre.	VI. Tons per square inch.	VII. Kilogrammes per square centimètre.	VIII. Atmospheres.	IX. Tons per square inch.	X. Tons per square inch.	XI. Atmospheres.
1	14·223	·00635	1	·07031	1	157·49	1	·00656	1	152·38
2	28·446	·01270	2	·14062	2	314·99	2	·01313	2	304·76
3	42·668	·01905	3	·21093	3	472·48	3	·01969	3	457·14
4	56·891	·02540	4	·28124	4	629·97	4	·02625	4	609·52
5	71·114	·03175	5	·35155	5	787·47	5	·03281	5	761·91
6	85·337	·03810	6	·42186	6	944·96	6	·03938	6	914·29
7	99·560	·04445	7	·49217	7	1102·45	7	·04594	7	1066·67
8	113·783	·05080	8	·56248	8	1259·95	8	·05250	8	1219·05
9	128·005	·05715	9	·63279	9	1417·44	9	·05906	9	1371·43

Note.—One atmosphere is taken to be 14·7 lbs. per square inch.

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of pounds per square inch in 32·1 kilogrammes per square centimètre (see cols. I. & II.).		of tons per square inch in 3210 kilogrammes per square centimètre (see cols. I. & III.).		of kilogrammes per square centimètre in 15 lbs. per square inch (see cols. IV. & V.).		of kilogrammes per square centimètre in 18·3 tons per square inch (see cols. VI. & VII.).		of tons per square inch in 3254 atmospheres. (see cols. VIII. & IX.).		of atmospheres in 14·6 tons per square inch (see cols. X. & XI.).	
kgs. per sq. cm.	lbs. per sq. in.	kgs. per sq. cm.	tons per sq. in.	lbs. per sq. in.	kgs. per sq. cm.	tons per sq. in.	kgs. per sq. cm.	atmospheres.	sq. inch.	tons per sq. in.	atmospheres.
30 =	426·68	3000 =	19·05	10 =	·7031	10 =	1574·9	200 =	1·31	10 =	1523·8
2 =	28·45	200 =	1·27	5 =	·3516	8 =	1259·95	50 =	·33	4 =	609·5
0·1 =	1·42	10 =	·06			0·3 =	47·25	4 =	·03	0·6 =	91·4
∴ 32·1 =	456·55	∴ 3210 =	20·38	∴ 15 =	1·0547	∴ 18·3 =	2882·1	∴ 3254 =	21·36	∴ 14·6 =	2224·7

ENERGY.

Metric to English.		English to Metric.	
I. Mètre-tons.	II. Foot-tons.	III. Foot-tons.	IV. Mètre-tons.
1	3·2291	1	0·3097
2	6·4581	2	0·6194
3	9·6872	3	0·9291
4	12·9162	4	1·2388
5	16·1453	5	1·5484
6	19·3743	6	1·8581
7	22·6034	7	2·1678
8	25·8324	8	2·4775
9	29·0615	9	2·7872

1 mètre-tonne is termed a "dinamode" in Italy.

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus find the number

of foot-tons in 4367 mètre-tons (see cols. I. & II.).		of mètre-tons in 3592 foot-tons (see cols. III. & IV.).	
mètre-tons.	foot-tons.	foot-tons.	mètre-tons.
4000 =	12916·2	3000 =	929·1
300 =	968·72	500 =	154·84
60 =	193·74	90 =	27·87
7 =	22·60	2 =	·62
∴ 4367 =	14101·26	∴ 3592 =	1112·43

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PART IV.

STATISTICS, OFFICIAL STATEMENTS AND PAPERS.

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I.

Statement of the First Lord of the Admiralty explanatory of Navy Estimates, 1891-92.

Introductory remarks.

THE Naval Estimates for 1891–92 show an apparent increase of £428,500 over those of 1890–91, the respective figures being £14,215,100 and £13,786,600.

This increase of expenditure is associated with an increase of duties, the custody of Naval Ordnance Stores having been transferred from the War Office to the Admiralty. This entails a special expenditure of £78,000, to meet which £70,500, hitherto borne on Army Estimates, has been transferred to Navy Votes. On the other hand an increased appropriation is anticipated from the Indian Government in aid of Naval funds for work done in Indian waters. The full subsidy payable under the Imperial Defence Act by the Australian Colonies will become due this financial year. Against this has to be put the cost of keeping in commission and reserve the seven ships constituting this special squadron, and the payment of an annuity for the redemption of the original cost of the construction and equipment of these vessels. The last instalment of this annuity will be paid on the 1st April, 1900.

Including these various contributions and items, the net increase to Navy Votes is reduced to £358,500.

New construction.

To appreciate the full advance made in new construction during the past year, and the progress anticipated in 1891–92, it is necessary to comprise all the vessels building for the Navy in the following groups, giving the sources from which their cost is met:—

1. Contract Ships. Old programme: cost met out of annual estimate.
2. Contract Ships. Naval Defence Act: paid for by special provision under Naval Defence Act and repayable by an annuity charged on the Consolidated Fund.
3. Australian Flotilla. Cost defrayed out of Consolidated Fund, repayable by an annuity chargeable on Naval Votes.
4. Dockyard-built Ships. Cost charged against Annual Naval Votes.

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Contract ships. Old programme.

At the close of the year 1890–91, of the ships building by contract only one ship belonging to the Old Programme of Construction will remain in the hands of private shipbuilders, viz., the Blenheim first-class cruiser, building on the Thames. It is anticipated that she will be delivered in the autumn of 1891.

Contract Work under Naval Defence Act.

The progress of work by contract under the Naval Defence Act during the year 1890–91 has been carried on under conditions of considerable difficulty, arising out of the great activity in mercantile shipbuilding, and the consequent extraordinary demands both for labour and materials. Notwithstanding these adverse conditions, very good progress has been made. Of the seventeen second-class cruisers building by contract eight have been launched, and one, the Latona, has been delivered at Portsmouth, where she is now completing for sea. A number of the remaining vessels of the class are rapidly advancing, and will be speedily set afloat. It is anticipated that with two exceptions all of them will be delivered by the ensuing autumn, and remaining two before April, 1892. The five first-class cruisers building by contract are also making good progress, and will be launched during the year 1891–92. Three of the four first-class battle-ships building by contract are now considerably advanced. The fourth is in an earlier stage of construction.

Armour.

The deliveries of armour for all the battle-ships, both building in the dockyards and by contract, have been on the whole so satisfactorily carried out as greatly to facilitate the progress of work. The manufacture of such large quantities of armour in so limited a period was a difficulty which required very careful consideration and prearrangement, but the necessities of the case have been well met, and notwithstanding the sudden past inflation of the price of metals the contracts made have been on the basis of the prices paid in 1886 for the armour of the Trafalgar and Nile. The whole of the contract programme of the Naval Defence Act has been thus placed, except six vessels of the torpedo gunboat type. They will shortly be put out to contract. As they are of small dimensions, their construction and completion will not occupy more than eighteen months.

Australian flotilla.

Causes of delay in delivery of ships.

The completion of the five cruisers and two torpedo gunboats, building under the Imperial Defence Act of 1888, has been delayed by the conditions of the market, both as regards labour and materials, but the main cause of the delay has been the unusually long period required for the completion of the steam trials of these vessels to surmount difficulties which have arisen with their boilers. It has been finally decided by the Board to take over the vessels without

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insisting upon the completion of the maximum forced draught trials embodied in the contracts. The natural draught trials of all the vessels have now been finished, and the results, within the limits of power developed, have fully realised or exceeded the intentions of the design. It was stated that with 4500 (natural draught) horse-power, the protected cruisers of the Katoomba (late Pandora) class would have measured mile speeds of 16½ knots. The typical vessel of the class, which has been tried, attained a mean speed of 17¼ knots for a period of eight hours' continuous steaming; and on the measured mile reached a maximum speed, with natural draught, of 18¼ knots, with an indicated horse-power of 5450. Steam trials.

In connection with the building and completion of the Australian Flotilla, an experiment was made that has proved completely successful. Having been built under a special Act of Parliament, it was decided that the vessels should be completed in all respects for sea, with the exception of their ammunition and consumable stores, at the works of the contractors. This arrangement it was hoped would avoid the delay, cost, and alterations which not unfrequently attend trials of contract-built ships at the dockyards. The anticipated advantage of this arrangement has been fully realised, and the trials of guns, torpedoes, and propelling machinery, have all been carried out and completed before the vessels have been handed over. They will all be ready for commission within the financial year 1890–91. Ships were completed by the contractors.

At the time when the Statement explanatory of the Navy Estimates for 1890–91 was drawn up, the designs for the Centurion and Barfleur were still incomplete. The vessels are now in hand, and the following are their leading particulars :— Second-class battle-ships.

Their principal dimensions are :—length, 360 ft. ; breadth, 70 ft. ; displacement, 10,500 tons. Speed on measured mile : forced draught, 18 to 18½ knots; natural draught, 17 knots. Coal supply at designed load draught, 750 tons. The armament of each ship will include : four 10-in. 29-ton guns in two barbettes; ten 4·7-in. quick-firing guns ; seventeen 6-pr. and 3-pr. quick-firing guns ; five torpedo tubes. above water ; two torpedo tubes, submerged. The disposition of the armament is very similar to that of the first-class battle-ships. The 10-in. guns are mounted in pairs in armoured barbettes which extend down to the steel protective deck at the top of the armour belt. These guns will be capable of being worked entirely by manual power, and, in addition, steam power will be supplied for the training of the guns and the supply of the ammunition. Dimensions. Speed. Coal supply. Armament.

The armour protection of the hull proper consists of a belt of armour, having a maximum thickness of 12 inches, extending over a Armour.

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length exceeding 200 feet amidships, being completed by armoured bulkheads, with a steel deck from 2 to 2½ inches in thickness at the top of the belt. Before and abaft the armour belt a strong protective under-water deck completes the protection to the bow and stern. Above the thick belt the broadside will be protected to a height of 9½ feet above water by steel armour and wood backing equivalent to a total thickness of 4 inches of steel. Screen bulkheads, similarly armoured, complete the protection to the sides of the barbettes. The barbette armour has a maximum thickness of 9 inches.

Thin armour.

The guns forming the auxiliary armament and their crews are also well protected, either by fixed casemates, or by strong shields revolving with the mountings.

The heavy guns forward are carried at a height of 25 feet above water, and those aft a trifle lower.

These ships, like the first-class barbette battle-ships, will be of high freeboard throughout their length, with a flush upper deck.

Reasons for increase in dimensions.

It will be noted that the size of these second-class battle-ships as built will exceed the dimensions of the original estimate. This increase in size has been approved after very full consideration, and is associated with the following advantages:—

(1) Wood and copper-sheathing on the bottoms, adapting the vessels for employment on distant services, where docking facilities may not be available.
(2) An increase in the weight of armament, both of guns and torpedoes.
(3) Improved protection, in the form of casemates, to the guns in the auxiliary armament.
(4) Larger and heavier boilers, giving a higher development of power for continuous sea service.
(5) The limitation of extreme draught, when fully laden, to 26 feet.

If these vessels are completed without further demands being made upon them for additional weights to be carried in connection with the armament or equipment, they will be capable of carrying 50 per cent. more coal than has been named above, and bunker space sufficient to carry this full supply has been provided.

Royal Arthur and Crescent.

The first-class cruisers, Royal Arthur and Crescent, were the last laid down in the dockyards under the Naval Defence Act of 1889.

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Modifications in designs.

After full consideration it was decided by the Board to modify their design in the following particulars:—

(1) To give to the vessels a long forecastle, extending about 110 feet from the bow, and increasing the height of freeboard forward by 7½ feet. Upon this forecastle, at a height of 25½ feet above water, two 6-inch quick-firing guns are to be mounted as bow chasers, in place of the single 9·2-inch gun carried forward on the upper deck in the other first-class cruisers.

A description of the design of the first-class cruisers appeared in the Navy Estimates of 1889–90, and it applies also to the Royal Arthur and Crescent, in all other respects than those above mentioned. These vessels will be wood-sheathed and coppered.

Designs for Astræa class. Second-class cruisers. Dimensions. Speed.

The experience gained by the behaviour of the cruisers during recent naval manœuvres determined the Board of Admiralty to somewhat modify the design of the eight second-class cruisers remaining to be built from the original design for the Apollo class described in preceding Navy Estimates. The principal dimensions of the Astræa class are:—length, 320 ft.; breadth, 49 ft. 6 in.; displacement, 4360 tons. Speed on measured mile:—forced draught, 19½ knots; natural draught, 18¼ knots.

Armament.

The armament consists of two 6-in. quick-firing guns, bow, and stern chasers; eight 4·7-in. guns, quick-firing on the broadside; nine 6-prs. and 3-prs. quick-firing; four torpedo tubes (18-in. torpedo new pattern).

Protection.

The thicknesses of protective deck, and protection to the machinery, as well as the coal supply to be carried at the designed load draught, are identical with those of the vessels of the Apollo class.

Copper-sheathed.

All these eight vessels are to be wood-sheathed and coppered.

Variation from the Apollo class.

As compared with the Apollo class, the essential difference is that they are of high freeboard throughout the length with a flush upper deck, instead of having a poop and forecastle and waist. Two 4·7-in. guns have been added to the broadside armament. The whole of the broadside armament is carried on the upper deck in the Astræa class at about eight feet greater height above water than in the Apollo class. This increase in dimensions, combined with higher freeboard, will greatly facilitate the continuous maintenance of a high rate of speed in a seaway.

Torpedo gunboats.

In my statement for 1890–91, I then pointed out that the orders for the remaining torpedo gunboats under the Naval Defence Act were purposely delayed, in order to benefit by the experience to be

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Steam trials.

obtained from the completion of trials then in progress with earlier vessels of the class. These trials have occupied a considerable period during the last year, as unforeseen difficulties have occurred with the boilers, when working at the highest powers intended in the design. These difficulties have with the experience gained been to a large extent overcome, but the maximum power under forced draught, originally intended to be developed, has not been obtained. The

Structural strength.

structural strength of the vessels has been severely tested during their long-continued steam trials, and several of them have been launched with machinery and boilers on board. The result has been satisfactory.

Two of the vessels are now in commission. The Speedwell has been attached to the Channel Squadron for several months, and took part in the Naval Manœuvres of 1890. The reports, which have been received, have on the whole been satisfactory in relation to seaworthiness and behaviour. The question of the modifications to be embodied in the designs for the vessels yet to be ordered is now on the point of being dealt with finally.

Dockyard-built ships.

All the ships that were ordered and commenced in the dockyards before 1889–90 will, with the exception of the Blake, be practically completed this financial year. This ship will be completed in 1891–92.

Ships under Naval Defence Act of 1889.

The number of ships of all classes building or to be built in the dockyards under the Naval Defence Act of 1889, by the 31st March, 1894, was thirty-eight, and they comprise *four* first-class battle-ships, *two* second-class battle-ships, *four* first-class cruisers, *twelve* second-class cruisers of the Apollo and Astræa classes, *four* second-class cruisers of the Pandora class, and *twelve* torpedo gunboats. Twenty-eight of these vessels are in hand, and are being advanced with great rapidity. Of the remaining ten, five second-class cruisers of the Apollo class will be commenced during the financial year 1891–92, and five torpedo gunboats will be laid down in the financial year 1892–93.

Battle-ships.

The first of the four first-class battle-ships, the Royal Sovereign, building at Portsmouth, will be launched on the 26th February; the second, the Renown, building at Pembroke, in May next; and the third, the Hood, at Chatham, will be ready for launching very shortly. The Royal Sovereign was laid down in the month of September, 1889, and the work upon her and the other vessels of her class has been performed with unprecedented quickness and economy. The two second-class battle-ships have just been commenced.

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First-class cruisers.

The first of the four first-class cruisers, the Edgar, was launched at Devonport in November last; the second, the Royal Arthur, will be launched at Portsmouth on the 26th February; and the third, the Hawke, is nearly ready for launching at Chatham.

Second-class cruisers.

One of the second-class cruisers was launched last August, and the second will be launched on the 10th February. Three of the second-class cruisers of the Pandora class are already afloat. Two of the torpedo gunboats, the Gossamer and Gleaner, have been launched, and are nearly complete. The machinery of these two vessels has been made in the dockyard, and the Gossamer has passed her steam trials with great success. She will be completed ready for commission during the present financial year.

Torpedo gunboats.

Manufacture in dockyards of propelling machinery.

The propelling machinery for several dockyard-built ships has recently been made in the workshops of those establishments. This step was originally taken for economical reasons, as it has been impossible to keep all the different classes of workmen and the plant necessary for dealing in an emergency with the repairs of the fleet profitably employed at other times upon small work. The experiment has been most successful both in the quality and cost of the work done. It is not, however, proposed for the present to do more in this direction than to so combine orders for new machinery with repairs as to keep up the engineering establishment to a proper standard of numbers and efficiency. The ships that have thus been engined are the gunboats Pheasant, Partridge, Lapwing, Ringdove, and Gossamer, and they have passed their steam trials with successful results. Those for which new machinery is now in hand are the Rupert—an old vessel requiring re-engining—the Astræa and Phœbe, two of the new second-class cruisers, and the torpedo gunboat Gleaner. The machinery for the second-class cruisers Fox, Forte, and Hermione, and the torpedo gunboat Hebe, will be taken in hand during the financial year 1891–92. This association work upon the machinery and hulls will be closely watched, and the whole effect of this arrangement as regards economy and efficiency be thoroughly tested.

Revised estimates.

The reductions previously reported in the cost of building the Trafalgar and Nile over the original estimates (which was based on the old system), have been confirmed as regards Trafalgar by the complete cost accounts for that ship. They alone show a saving of over £100,000. The vessels of the same class now building under the Naval Defence Act have been built at a cheaper rate, up to date.

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Reconstruction. The re-arming and re-engining of Thunderer has been completed during the year, and similar work upon Devastation, Rupert, and Hercules has been advanced as far as possible.

Refits. Alexandra. The Alexandra has had new boilers fitted and her armament partly altered, and she will now be commissioned as the flagship of the Reserve Squadron.

Achilles. Minotaur. The Achilles and Minotaur have been similarly dealt with, but their main armaments remain unaltered. The Minotaur has been completed; and the Achilles will be passed into the first-class reserve before the end of the present financial year.

Superb. The Superb has been re-engined and re-boilered, and she will now be placed in the first-class reserve.

Swiftsure, &c. The repair and refit of Swiftsure, Satellite, Icarus, Wrangler, Racer, and Starling will be completed during the present financial year; similar work in the Nelson and Calliope will be also well advanced.

Miscellaneous dockyard services. The expenditure under this head, which comprises repairs to yard machinery, yard plant, &c., storekeeping, manufacture and repair of ordinary stores for issue to ships, &c., has been for some time past closely watched and kept as low as possible without sacrifice of efficiency at the various yards.

At home. This class of expenditure at the Naval

Abroad. yards abroad is now being personally looked into with other matters of importance. The inspection of these yards by Admiralty Officers has made considerable advancement during the last two years, and much good has resulted from it.

Final steam trial of ships. The total number of vessels which, since 31st March last, have passed their final machinery trials are:—

No.	Class.	Name.
2	Battle-Ships	Nile, Thunderer.
9	3rd Class Cruisers	Blanche, Blonde, Barracouta, Bellona, also the five Colonial Cruisers, Tauranga, Ringarooma, Katoomba, Mildura, and Wallaroo.
2	1st Class Screw Gunboats . .	Lapwing and Ringdove.
10	Torpedo Gunboats	Speedwell, Skipjack, Seagull, Salamander, Sheldrake, Sharpshooter, and Spanker, Gossamer, and two Colonial Boats, Karakatta, Boomerang.
1	Tug and Water Tank Vessel . .	Asp.

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It is anticipated that the following ships will pass through their machinery trials before 31st March next, viz.:—

No.	Class.	Name.
1	Battle-Ship	Superb.
1	Torpedo Depôt-Ship . . .	Vulcan.
1	2nd Class Cruiser	Latona.
5	3rd Class Cruisers	Pearl, Philomel, Pallas, Phœbe, and Barham.

Vulcan.

I stated last year that the trials of the Vulcan would take place early in this financial year, but owing to difficulties which have been encountered with the boilers of ships similarly fitted, viz., with double-ended boilers having common combustion chambers, it was considered desirable to postpone the trials of the Vulcan, and those of other ships, till certain further experiments with their boilers had been completed. On the steam trials of the Blanche and Blonde the principal defects developed were connected with leakage of boiler tubes. To remedy this the Engineer-in-Chief directed the number of tubes to be reduced, believing that the leakage was largely due to a want of circulation of water over the tube plates. This alteration reduced by about 5 per cent. the I.H.P. expected to be obtained, but the leakages were practically stopped. It was afterwards decided not to carry out in vessels thus boilered the extreme forced draught trial.

Blanche and Blonde.

New type boilers.

All the battle-ships and cruisers now building under the Naval Defence Act have boilers of a different type, and their capacity and weight have in most instances been largely increased from the original design. The air pressure or forced draught under which their maximum speed is to be developed is limited to a pressure of one inch on the water gauge. Every precaution has been taken to prevent a repetition of the difficulties recently experienced. The Latona, the first of the thus-engined vessels, is now undergoing her steam trials. They have been completely successful. On the eight hours natural draught trial 7250 H.P. have been developed, as against 7000 contracted for, giving a speed of 19 knots, as against 18½ promised on the design. At the conclusion of the trial a thorough examination showed the boilers to be in a practically perfect condition. On the forced draught trial, with a moderate air pressure of about one inch, the high speed of 20 knots was reached without difficulty.

Latona.

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Barham and Bellona.

The estimates as to maximum power with forced draught in the boilers of the torpedo gunboats, and also of the Barham and Bellona (third-class cruisers), which are of the locomotive type, have not been realised. The earlier trials developed defects chiefly connected with leakage of boiler tubes. Various experiments were carried out, the results of which led to certain modifications being made in these boilers; and on progressive trials since carried out in some of these ships an I.H.P. of 3900 has been obtained, as against 4500 originally specified, or within $12\frac{2}{3}$ per cent. of that H.P. This reduction in power represents a loss in speed of about a knot under forced draught conditions. The trial with maximum forced draught in vessels with boilers of the locomotive type has not been pressed. In the five boats of this class now under construction larger and heavier boilers will be fitted, and a lower maximum power has been specified, while the power at limited air pressure, which is unaltered, will be more easily obtained and maintained. The orders for the machinery of these boats have been placed.

Increased boiler power in later ships.

Review of trials during the year.

The review, therefore, of the steam trials of the past year cannot be said to be altogether satisfactory. The difficulties experienced have been overcome, but by changes reducing the estimated I.H.P. and speed of the vessels. The Engineer-in-Chief deserves high credit for the assiduity and ingenuity which he has displayed in overcoming the difficulties connected with the designs of boilers which he did not originate. The specifications and details of marine engines are of so technical a character that none but a trained and practical engineer can adequately supervise or criticise them. Thus an unusually heavy responsibility is centered on the Engineer-in-Chief which cannot be shared by members of the Board of Admiralty. The dimensions of a ship, its armament, and equipment can be criticised, altered, and discussed by naval officers, and laymen even, although they may have little technical knowledge of the principles of shipbuilding. Such a discussion or examination is not possible, to the same extent except by trained experts, upon the specifications of a design for marine machinery. The hasty adoption of a faulty principle or immature idea in the designs of engines might not be detected outside the department preparing or initiating the design until the actual working of the engines themselves revealed the mistake made.

Work of the Engineer-in-Chief.

Measured mile trials.

The first public test imposed on engines and machinery of men-of-war is the measured mile trial. In this age of eager competition the wish to beat all recorded performances is a legitimate ambition of a skilled engineer. The measured mile lends itself to a fallacious test,

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for the ratio of boiler to engine power, which on a given weight will give the highest speed under limited conditions both of time and distance, is not the proportion which will ensure the best result for longer distances in the open sea.

Committee of Engineer-in-Chief and naval engineers.

When the designs for the machinery of the first ships to be built for the Naval Defence Act were under consideration, three Inspectors of Machinery from the Dockyards, as representing the latest views of seagoing engineers, were formed into a Committee to co-operate with the Engineer-in-Chief. The result of their joint deliberations was a large increase in the boiler power of the cruisers, and the addition of weight by the substitution of single for common combustion chambers. The Board of Admiralty propose to make permanent this Committee, and to associate with its work certain remuneration. Their duty will hereafter be to examine all new designs, and as the members of the Committee will be selected from the Inspectors of Machinery and Chief Engineers of the Dockyard who are periodically changing, it will continue to represent the latest views of practical seagoing and manufacturing engineers. In making this Committee a permanent institution the Board of Admiralty wish at the same time to record their full confidence in the Engineer-in-Chief, who has discharged his exceptionally onerous duties with ability and discretion. They believe that the establishment of such a Committee will not only ensure the necessary combination of theory and experience, but will be a guarantee that changes and innovations of importance in the machinery of the Navy will not be adopted without full discussion and adequate experiment.

Naval Defence Act.

The work contemplated by the Naval Defence Act is now sufficiently advanced to enable a reliable forecast to be made both of the date at which it will be completed, as well as of its actual as compared with its estimated cost. The number of ships to be built was seventy, of an estimated displacement of 316,000 tons, and carrying 540 guns, exclusive of machine guns and guns of small calibre. The whole of these vessels with their armament and equipment were to be completed and ready for commission before the 1st April, 1894. With the single exception of one contract-built ship, whose progress has been slow, there is every reason to believe, upon our present data, that the remaining sixty-nine will, with their armament and reserve guns, be finished before the date named. The sketch estimate made in 1889 of their prospective cost made an allowance of £10,000,000 for 32 contract-built ships and £11,500,000 for 38 dockyard-built ships. This was inclusive of armament and equipment.

Progress in the ships building under this Act.

Total estimate.

The 32 contract ships will, so far as we can foresee, be finished,

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armed, and equipped for that sum. The extra guns for reserve will also be provided, but owing to certain additional charges which I will subsequently enumerate, we shall not be able to supply in addition the amount of reserve ammunition we have originally contemplated.

Reason why estimates are exceeded.

On the armament of the dockyard-built ships there is a saving of £313,000 and an excess of £920,000 on the hulls, boilers, and machinery, making a net excess of £607,000. This excess over the original estimate is due to a remarkable rise in prices, to the substitution of larger and heavier boilers in the cruisers, necessitating an increase in their dimensions, to the strengthening of the gun mountings and gun pedestals to meet the recoil of the higher velocity imparted by smokeless powder, and to certain modifications and improvements in the later of the dockyard ships suggested by the experience gained at the Manœuvres and elsewhere afloat. Of the causes which thus disturbed our calculations all except rise in prices represent a distinct gain in the efficiency and power of the ships building, and a rise in prices, even though it may prejudicially affect Navy votes, more than compensated the exchequer from which such payments are made by its addition to the national revenue.

New system of finance, &c., compared with the old.

At the time the Naval Defence Act was under consideration, it was urged by its advocates that the method of placing a statutory obligation on a department to finish a great ship-building programme in its entirety within a given time would ensure a rapid and continuous prosecution of ships once begun, would prevent subsequent structural alterations and changes, and would further secure a closer adherence to the original estimates of cost than the more dilatory and changeable system it superseded. The administrative advantages associated with the change then inaugurated have been completely realised, and although I regret that the financial results show an excess over the forecast of expenditure, still the improvement even in this respect is satisfactory. Taking the actual cost of the larger ships built for the ten years previous to 1885, they show an excess on the average over their original estimates, as presented to Parliament, of from 20 to 30 per cent. The excess here shown is less than 3 per cent., and including the amount of the reserve ammunition, less than 5 per cent. Under the old system the excess over individual estimates was so buried in the general expenditure of the year that notice or attention was not necessarily directed towards it. But any excess of a statutory maximum requires a fresh Act of Parliament for its sanction and a special vote to defray it. To meet this excess no special provision over and above the ordinary estimates is necessary. Between now and April, 1894, we calculated that if the ship-building

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vote remained at its present level, and the Naval Defence Act Estimates were not exceeded, there would be an aggregate surplus on that vote of about £3,000,000, and any excess will be met out of that sum. We do not propose this year to introduce any special Act to enlarge the limits of expenditure of the original Act, as it will be better to wait until actual figures can be substituted for the forecast now made.

The success which has attended the changes of late years in the dockyards, and the reduction in cost of work done, is largely due to the manner in which the trades and workmen of the dockyards have accepted these reforms. The Admiralty have, therefore, been glad to be able to recommend to the Treasury, after a careful inquiry into the petition and complaints of the men, an increase to the wages now paid. This rise will commence on the 1st April next. The increase in wages will be an addition, so far as new construction is concerned, to the present estimated cost of the ships building under the Naval Defence Act.

Workmen's wages increased.

The satisfactory rate of progress with the manufacture and supply of guns for the Navy, which was mentioned in the statement for last year, has been maintained during the year ending December 31, 1890, and the total number of new breech-loading guns (exclusive of small quick-firing and machine guns) completed by the manufacturers during the year is 240, viz. :—

Naval ordnance.

Nature of Gun.	No. completed.
16·25-inch of 110-tons	2
13·5 „ „ 67 „	11
10 „ „ 29 „	2
9·2 „ „ 22 „	12
6 „ „ 5 „	12
6-inch quick-firing	2
5 „ of 40-cwt.	41
4·7 „ quick-firing	134
4 „ of 26-cwt.	24
Total	240

The manufacture of the guns for the ships building under the Naval Defence Act, 1889, has been materially advanced, especially in the case of the heavy guns which are being made in the Royal Gun Factory. The number of breech-loading guns afloat and mounted on December 31, 1890, was 1410 as compared with 1293 on December 31, 1889. This is exclusive of small quick-firing and machine guns.

Much discussion has taken place on the relative value of hand and hydraulic worked guns. As frequently pointed out the 10-inch breech-loading gun of 29 tons weight is the heaviest service gun which it is considered can be efficiently worked on board ship by

Working of guns by hand or hydraulic or steam power.

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hand power alone. The Thunderer has recently been re-armed with four such guns, and has just completed her gunnery trials satisfactorily. In the new second-class battle-ships it is arranged that the 10-inch guns will be similarly worked by hand; but even with 10-inch guns, except when mounted singly, it is imperative to employ steam or hydraulic power for efficiently training the turret or barbette under ordinary circumstances, accepting manual power only as a reserve with slower motion. The type of mounting which hand-working necessitates has, however, certain disadvantages, compared with one worked by hydraulic power. For instance, if placed in a turret a much larger port is required, since a hand-worked gun must be pivotted further inside the turret, owing to the use of trunnions, than one on an hydraulic mounting, involving greater exposure of the gun, mounting, and gun's crew; whilst if placed in a barbette, the gun and a portion of the mounting are permanently above the thick armour protection, and this disadvantage is serious. Then there is considerable difficulty in working by hand the breech-screw of a heavy gun, as well as the various parts of the mounting, without the introduction of mechanism far more delicate and liable to injury than the hydraulic arrangements now in use.

Difficulties with hand gear.

Hydraulic mechanism.

It is very often objected that guns worked by hydraulic power are more liable to failure than those worked by hand, and that the mechanism is delicate. This is not correct. As stated above, the adoption of hand-worked guns of large size necessitates the introduction of various mechanical devices to give the necessary power to the hand gear. Hydraulic mechanism, on the other hand, is exceedingly simple; and if a comparison be made between the actual machinery for opening and closing the breech of a 9·2-in. breech-loading gun of 22 tons, and the 16·25-in. breech-loading gun of 110 tons, the former by hand, the latter by hydraulic power, the latter has undoubtedly the advantage in simplicity. The above reasons have so far militated against the adoption of hand-worked mountings for guns of heavier calibre than 10 inches. No doubt much larger guns than these can be worked by hand-power alone, but there would follow a corresponding increase in the complexity of the mechanism required to enable manual labour to work the heavier moving parts. At the same time every endeavour has been made to introduce, where possible, alternative hand gear in connection with the hydraulic mountings of the new first-class battle-ships, and where hand gear has been found to be impracticable, duplication of the machinery has been adopted.

In order to test the accuracy of the statement so frequently made

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Test of rapidity of fire with large guns.

that the heavy breech-loading guns can only be fired once in a quarter of an hour, four rounds were fired from one of the 67-ton guns in the Trafalgar's turret as rapidly as possible during the gunnery trials of that ship. The time occupied was 9½ minutes; this rapidity would be exceeded in a ship which had been a short time in commission, when the gun's crew would have gained more experience, and had become accustomed to work together. Eight rounds could have been fired in the same time had both guns been worked together.

6-in. quick-firing guns.

The most important advance made in Naval Ordnance during the year has been the completion of the new 6-in. 100-pounder quick-firing gun and mounting. Most satisfactory trials have already been carried out, and the results attained are far in advance of anything that has before been accomplished. As many as six rounds a minute have been fired. The type of mounting is a very great advance on previous designs, especially as regards the amount of protection afforded to the gun's crew. The full power, however, of these quick-firing guns will not be advantageously employed until smokeless powder has been introduced into the Naval Service. Arrangements are now in progress for issuing smokeless powder to certain ships for further trial under service conditions, and it is hoped that its general adoption into the Naval Service will not be long delayed. The

The 4·7-in. quick-firing gun.

4·7-in. 45-pounder quick-firing gun, with which further experience has now been gained, has proved to be thoroughly efficient. Several ships armed with this weapon, including the whole of the Australian squadron, have completed their gunnery trials with most satisfactory results.

White-head Torpedoes.

During the year ending 31st December, 1890, 150 of the more powerful Whitehead torpedoes referred to in last year's report, together with 587 of the previous smaller pattern, have been added to the existing stock.

Custody of Naval Ordnance.

An important inquiry as to the custody of Naval Ordnance stores and the accounts connected therewith has been carried to a successful issue. On March 31st next the Admiralty will assume entire control of the custody of all Naval Ordnance stores at Portsmouth, Devonport, Chatham, and Woolwich; and during the course of the year it is hoped that similar arrangements will be made as to the remaining ordnance depôts abroad, and the minor depôts at home. This important reorganisation will be effected without any increase in the cost of management, and it is believed that at last a thoroughly satisfactory solution has been arrived at of a most difficult problem. While a complete separation will be thus effected as regards the

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custody, accounts, and administration of Naval Ordnance stores, the necessity of absolute interchangeability in ordnance material belonging to the Navy, Army, India, and the Colonies respectively, has been assured by making it a *sine quâ non* that all sealed patterns and experiments shall be dealt with by the Ordnance Committee, and that all guns and ordnance stores of every description shall pass through one central inspection department before issue. Further modifications may be desirable and will be considered, but in so large and important a matter it is very desirable to act with caution so as to avoid too great a disturbance in the current work of supply and administration of stores valued at twenty millions sterling.

Armour-plate experiments.

During the year 1890–91 an extensive series of experiments with armour-plates has been carried out in continuation of those which have been in progress during the last three years. These trials have added largely to our information as to the qualities of different kinds of armour, and has led to a considerable extension of the sources of supply for armour-plates. The range of the experiments has been great, extending from plates 4 in. in thickness up to plates 18 in. in thickness, fired at by guns varying from 5 in. in calibre to 12 in.; and including examples of the best modes of manufacture in compound (or steel-faced) armour and steel. Under the last-mentioned category several specimens of nickel-steel armour have been fired at, the first nickel-steel plate being tested in April, 1890. Arrangements have been made for the continuation of these experiments in connection with the supply of the armour for the Centurion and Barfleur.

Result arrived at.

The broad conclusions hitherto arrived at and acted upon have been that for armour of the thicknesses required for the main defence of the first-class battle-ships, compound (or steel-faced) plating was to be preferred.

Steel armour.

These experiments show that the manufacture of steel armour has greatly improved of recent years, whilst that of compound armour has been less progressive. All steel armour has therefore been used in large quantities for the secondary defence of the battle-ships, for the protection of the auxiliary armaments, and for the protection of the machinery in vessels of the cruiser classes. It has not been considered expedient hitherto to publish details of these experiments; but, in order to encourage British manufactures in every possible way, full details of the trials of any particular plates have been furnished to their makers, and in many cases the Admiralty have undertaken to fire at experimental plates supplied by the manufacturers.

The estimate for the New Works vote for 1891–92 shows a reduc-

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tion, chiefly due to a less sum being taken up for storehouses and other works for naval ordnance stores. During the present financial year the new dock at Malta will be completed, and the extension of the yard will be completed in 1892–93. The coaling arrangements at Portland are well in hand. At Portsmouth the new coaling station will be ready for use this year. It is proposed to proceed at once with the construction of a coaling jetty at Keyham dockyard. The estimate for this work is £70,000, which includes the necessary railways and approaches, &c., but is exclusive of machinery.

New works.

New dock at Malta.

Coaling arrangements.

The naval gunnery establishment and barracks at Whale Island, Portsmouth, will be completed by the end of the current year. It is proposed to commence the construction of new Naval barracks at Portsmouth to accommodate 50 officers and 1000 men. The favourable results anticipated from the substitution of commodious buildings on shore for the old hulks in which the seamen were previously accommodated, have been fully realised in the case of Whale Island and Keyham Barracks, and the extension of the system of naval barracks is recognised as a matter of urgent necessity. The Admiralty are now in negotiation for the transfer from the Home Office of the late convict barracks at Chatham, which at a moderate cost can be converted into and fitted up as naval barracks. They are in the immediate vicinity of the dockyard.

Whale Island and Naval Barracks.

The dredging of the channel of the river Medway will be completed early in the current year.

At Haulbowline it is intended to provide dolphins at the basin entrance to the new dock to facilitate the passage of ships; in other respects the works are now completed.

At Sydney, New South Wales, naval works comprising naval and victualling stores, engine and ship repairing factory, deep water wharf with sheers to lift the heaviest guns, and extensive magazines for naval ordnance stores, are being carried out by, and at the expense of, the Colonial Government. The completion of these works will allow of the surrender of the Admiralty Establishment at the Circular Quay, Sydney, to the Colonial Government.

Works at Sydney.

At Bombay, a dry dock constructed by the Port Trust, of the following dimensions, is approaching completion:—Length on floor 500 feet, breadth of entrance 65½ feet, depth for docking 27¼ feet at high water ordinary spring tides. The dock will admit the Aurora and Edgar classes of H.M. ships, but not the largest battle-ships.

New dry dock at Bombay.

The Halifax Commercial Dock subsidised by the Admiralty is now open and the first payment will be made in 1891–92. The two

Halifax dry dock.

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other subsidised docks at Esquimalt and Hong Kong are both open and in use.

Signal stations.

For the purpose of affording communication, 120 new signal stations have been recently established round the coast of the United Kingdom.

Mobilisation and manning requirements of the fleet.

Mobilisation of 1890.

In a paper already laid before Parliament (November, 1890) a full description has been given of the partial mobilisation of the Fleet and Manœuvres in 1890. The order for the partial mobilisation was issued on July 21st, and on the following day 48 ships and torpedo boats (24 of each) were commissioned. In addition to these, nine coast guard ships and three guard ships, all armour clads, had their crews completed, and on the 26th the whole of the 36 ships, with three exceptions, and torpedo-boats had reached the places of assembly, forming, together with the Channel Squadron and Training Squadron, a total of 56 ships of various classes, and 24 torpedo-boats. As the number of ships, especially those of modern types, in permanent commission previous to mobilisation was larger than in 1889, the actual number suddenly put in commission by the order to mobilise was less than in the preceding year. About 9000 men were added to those already afloat, and the total number engaged in the subsequent manœuvres was about 19,000. There were practically no deficiencies in manning the above-mentioned ships, and the resources in engine-room ratings allowed a certain number of supernumerary stokers to be carried for training. The report of Commanding Officers on these men were very satisfactory.

Medway facilities not sufficient.

One of the impediments to efficient and rapid mobilisation is the condition of Chatham-Sheerness as a naval port. The increased capacity of Chatham Dockyard has outstripped the available resources of the *personnel* there located. Considerable numbers of men have to be transferred from the western ports to complete the complements of the ships in this eastern port. This is especially the case as regard gunnery and torpedo ratings, there being no gunnery or torpedo school attached to the Chatham-Sheerness command. To remedy this inconvenience, steps are being taken to obtain increased barrack accommodation, and to so add to the Chatham establishments as to make them, as far as is practicable, self-supporting.

Signal stations mobilised.

The chain of signal stations established round the coast of the United Kingdom were mobilised on August 7th, the day before the 1890 Manœuvres commenced, and during the progress of the simulated hostilities, the system of distributing intelligence, which had been somewhat modified in accordance with the experience

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gained during the Manœuvres of 1889, was tested with satisfactory results. Too much importance cannot be attached to this part of the preparation for war, and to the necessity of periodically subjecting to a practical test the completeness of this portion of our arrangements. The only two points in which these arrangements now fall short of completeness are :—

1. In the connection of certain of the signal stations with the general telegraphic system, and
2. The provision of semaphores for signal stations on the coasts of Scotland, Ireland, and the West of England, those for the South and East coast of England having been provided this year.

With regard to (1) where it is not proposed to actually connect up stations, arrangements are being made for doing so as rapidly as necessary in case of emergency, and the full provision of semaphores, though postponed this year, will be taken in hand the year following.

Home Hospitals.

Advantage was also taken at the time of the manœuvres to test the sufficiency of the accommodation of the home hospitals for wounded men in time of war, the efficiency of the staffs of the establishments, and the arrangements for the prompt reception and treatment of such patients. The result of the investigation was very satisfactory, and it was found that there would be ample means by expansion in time of pressure.

Health of the Navy.

The health of the Navy during 1889, the last year for which returns have been tabulated, has been most satisfactory, the rates of sickness, invaliding, and death being lower than in many preceding years.

Increase of ships in commission.

Owing to the increase of duties imposed on our sea-going fleet, considerable additions have during the last eighteen months been made both to the number of ships and men in commission, especially in the Mediterranean and Channel Squadrons; the number of ships and men in commission being :—

	Ships.	Complements.
1st January, 1891	277	43,296
1st April, 1889	266	38,928
Increase . . .	11	4,268

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Trained men in reserve.

This increase to our fleets abroad has reduced the number of trained men in reserve at the home ports, and pending the additions to the seamen class, which the very large entries of boys during the last two years will give, some difficulty has been experienced in providing all the reliefs required for service abroad. An investigation into the actual duties which engage the naval service shows how large a proportion of officers and men are locked up in training establishments and educational courses, and in performing subsidiary work, such as surveying, and transport of troops, &c. At the time when the ships in commission were insufficient to give adequate work and training to the officers and men of the fleet, such employment was judicious, but when the number of fighting vessels is so increased as to be more than able to employ and train the peace establishments, the employment of very highly trained and instructed men in work of so secondary a nature is a waste of power. I am therefore taking steps to reduce as far as I can the number of officers, men, and boys afloat in non-fighting vessels, and at the same time to shorten the general course of study for officers at the Naval College, and of gunnery and torpedo instruction for all but those who show special aptitude and ability. These changes will in course of time give some relief, and increase the numbers available for foreign reliefs and active service at home.

Officers and men locked up.

Increased demands for manning ships.

In looking ahead to the increased demands which the gradual completion of the new ship-building programme will make upon our manning resources, I have endeavoured to keep in view and combine certain definite objects. It seemed to me to be quite unreasonable to expect that the whole of the extra force required to man, three years hence, our greatly increased fleet, should exclusively consist of officers and men on the permanent establishments of the Navy, of continuous service and entitled to pension, I was therefore anxious to associate the increase of the permanent establishments with a steady growth in the numbers and efficiency of the Royal Naval Reserve. The additions which have been made to the *personnel* of the Navy, since the Naval Defence Act was passed, have been large. Vote A stood at 62,600 in March, 1889. It has now reached 68,800; and I propose to raise it to 71,000 this year, and gradually to work up in subsequent years to a total of 75,000. Success in future naval wars will, I believe, rest not so much with numbers as with the force who can make the best use of the scientific weapons at their disposal.

Royal Naval Reserve.

Recent additions to Personnel.

The requirements of the naval service may be thus classified in the order in which there is the most difficulty of supply.

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1*a*. Executive Officers.
1*b*. Warrant Officers.
2*a*. Engineer Officers.
2*b*. Engine-room Artificers.
3. Petty Officers and Seamen.
4. Fleet Artificers.
5. Stokers.

Time for training the several classes.

1 and 2 represent officers and men for whose complete training years are required. They could not be obtained to any considerable extent in an emergency. 3 and 4 require a more limited training and, with the exception of petty officers, probably could be obtained in considerable numbers in an emergency if high enough terms were offered. 5 requires only a limited training and could be obtained rapidly at short notice. Following out the views which this classification suggests, I propose that the increase to the establishment should mainly consist of highly trained-men, and I wish to supplement this addition by arrangements for drawing largely in time of emergency (but with the assent and co-operation of their employers), upon those whose work and daily vocation specially trains them for service afloat. The sufficiency of my proposals entirely depends upon how far the Royal Naval Reserve is a reliable auxiliary force, upon which the naval authorities can, in emergency, lay their hands with confidence. It must be remembered that in addition to our war ships and subsidised cruisers, armament for fifty merchant cruisers is provided in our dockyards at home and abroad, and the complements of these ships must mainly be provided from the Mercantile Marine. The Royal Naval Reserve therefore constitutes a larger part of our system of naval defence than at first sight is apparent. If this force is one which can be made a trustworthy complement of the regular forces, the time has arrived when it should be further developed. If it is merely a peace paper force it should be abolished, and the money spent upon it devoted to an increase of the regular establishment. I enclose the report made to me by Vice-Admiral Sir George Tryon, Admiral-Superintendent of Reserves, upon the result of his inspection and experience of the past year. It is highly satisfactory, I thought it however advisable to more thoroughly sift the whole question, and to obtain such an authoritative report as would justify decisive action one way or the other. I have therefore appointed a Committee "to enquire into and report on the present system for the enrolment and maintenance

Proposed increases.

Complements for the armed merchant cruisers.

Sir George Tryon's report.

Appointment of a Committee.

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of the Naval Volunteer Forces raised under 22, 23 Vict.,* and under 36, 37 Vict.† Also to enquire and report on the numerical strength of the force, with a view to a possible increase, both in numbers and efficiency, of a reserve closely and intimately connected with the regular naval force of the country, with authority to call witnesses and report, and to enquire at ports when necessary personally or by Sub-Committee."

The Committee will consist of—

Vice-Admiral Sir George Tryon, K.C.B. (Chairman).
Captain E. Rice, R.N.
Captain T. F. Hammill, R.N. (Naval Intelligence Department).
Mr. Swanston, C.B. (Board of Trade).
Sir Charles Rivers Wilson, K.C.M.G., C.B. (representing Treasury).
Sir Allen Young, C.B., Hon. Commander, R.N.R. and R.N.A.V.
Mr. Ismay (White Star Line).
Captain Angrove (P. and O. Company), Hon. Commander, R.N.R.

Increase in numbers.

The increase to Vote A this year will comprise 2200, made up as follows:—

Commissioned Officers	17
Subordinate Officers	70
Warrant Officers	52
Artificers	125
Engine Room Ratings	670
Other Petty Officers and Ratings	361
Boys (Service	755
Boys (Training	150
Total	2200

Additional training ship for the north.

The increase to the number of boys in training will require an additional training ship. At present all the ships engaged in this work are located in the south of England. A training ship is a recruiting attraction, and the districts in which they are placed consequently contribute more than other parts of the country to the manning of the fleet. A large proportion of the hereditary seafaring class is now to be found in the northern districts of the country, and, with a view of obtaining recruits from this natural

* The first Act refers to the force popularly called the R.N.R.
† The second Act refers to the R.N.A.V.

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source of supply, the new training ship will be placed in the Firth of Forth at Queensferry.

General administration.

Changes in the composition of the fleet.

The changes proposed in my statement of last year by which the Mediterranean Fleet was to be raised to a strength of ten battleships and two armoured cruisers, the Channel Squadron converted into a homogenous squadron of modern ships of high speed, and sea-going ironclads substituted for the hulks then flying the flags of the Commanders-in-Chief at the home ports have all been carried out, with the single exception of the flagship at Portsmouth. The Nelson will in a short time take the place of the Duke of Wellington.

Foreign policy.

There has been shown of late an increasing tendency on the part of naval authorities abroad to concentrate the great bulk of their fleets in their home waters. I do not therefore contemplate any considerable addition to our fleet in commission abroad, but the increased numbers which we propose to take in this and subsequent years will, by being employed in keeping effective in reserve, the large number of ships to be delivered at the dockyards, enable a much needed change to be effected in our dockyard administration. Under present arrangements ships, until complete, are under the control of the Admiral-Superintendent. On completion they are passed into 1st Class Steam Reserve and are then under the Captain of the Steam Reserve, and on commission they pass under the authority of the Commander-in-Chief. The Captain of the Steam Reserve's duties are multifarious, and his staff is limited. Complaints have been made that in the intermediate stage after completion and before commission, vessels have from imperfect supervision and want of caretaking gone back, and that the success of a rapid mobilisation might be seriously impaired in consequence of these drawbacks. The Board has therefore given directions for the Commander-in-Chief to take charge of the vessels when complete and after inspection. Thus the redundant or supernumerary men under his orders can be utilised in keeping effective the ships in reserve, and it is hoped that in the case of the vessels next for commission a certain proportion of the complement will be permanently attached to them.

New arrangements made for charge of ships on completion.

Alterations in limits of foreign stations.

A careful enquiry into the limits and areas of our foreign stations abroad has been made during the last twelve months with a view to such a new delimitation as the strategical, commercial, or political considerations of the present time might suggest. Only two alterations of importance are proposed. The limits of the present Cape station end on the East Coast of Africa at Delagoa Bay, but

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on the West they run up to 20° North latitude, or in other words, 55° north of the head-quarters of the station. The distance from the Cape, the insalubrity of the climate, and the small class of vessel there employed, render it desirable to make the North-West Coast of Africa into a separate command. The future head-quarters of the station will be Ascension, and the squadron will be re-fitted and relieved direct from home. On the East Coast the Cape station will be extended up to the Equator, thus placing under one naval authority the whole of the East Coast between the Equator and the Cape. These changes will take place on the 1st April. They involve no increase of ships in commission, but a different distribution between the various stations. The other change is a sub-division of the present Pacific station, by which the whole of the West Coast of South America would be taken from that station, and, together with the East Coast of South America, be placed under a new command, with head-quarters at the Falkland Islands. Enquiries are being made as to which of the harbours in these islands is most suitable; in the meantime no action is proposed.

North-West Coast of Africa to be a new command.

Another new command of both Coasts of South America.

The transfer of the custody of naval ordnance stores from the War Office to the Admiralty is the latest of the various steps taken in recent years to give to the Admiralty control over, and responsibility for, business, which, from its very nature and incidence, could not be as satisfactorily undertaken by another department. There are officers in both services who believe that this transfer of duties from the Army to the Navy might with advantage be pushed much further, and that measures should at once be taken by which the Navy should immediately undertake the defence of the great naval ports, and be, in time of war, responsible for the safety of the base of their own operations. I admit that if such a change could be carried out it would tend to secure unity of action and responsibility, and would, in an emergency, secure at the great naval ports the rapid utilization of all available resources, for whatever movement the exigency of the moment might require. But it is a proposal that involves so immense a change, that it is not under any conditions practicable in the immediate future. The transfers of men and money, material and buildings, which it entails would revolutionise the proportions the Army and Navy now bear to one another, and many experienced naval officers are averse to the change. Moreover, its increased cost in one direction is certain, whilst the counterbalancing savings are problematical. Still, looking to the fact that nearly every foreign power has adopted the principle of placing their naval authorities in charge

Custody of naval ordnance stores.

Further change possible.

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of maritime defences, care should be taken that the various alterations which from time to time must occur in the organization both of the Army and Navy, do not increase the obstacles to such a transfer of duties. Further investigation and experience can alone determine whether the change is desirable in the common interests of both services, and nothing in the meantime should be done to prejudice that future decision.

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II.

VICE-ADMIRAL SIR GEORGE TRYON'S REPORT ON ROYAL NAVAL RESERVE.

During the past year the number of Royal Naval Reserve officers has increased—in the case of lieutenants, from 103 to 150, and of sub-lieutenants from 202 to 262, and of midshipmen from 173 to 194.

Number of R. N. R. officers increased.

The numbers allowed to be borne in future have been increased—

From 150 to 250 Lieutenants.
„ 270 „ 420 Sub-lieutenants.
„ 200 „ 300 Midshipmen.

Numbers of R. N. R. officers on board H. M. ships.

The number of officers selected for a year's training, actually on service on board Her Majesty's ships, has been maintained till recently at the fixed number of 20 annually, but last year it was decided to increase that number. Since the regulations on this subject came into force in 1887, 33 officers have served for a year's training in the Royal Navy; and, further, there are now 21 still serving who are in course of completing the year's service. Other officers have been entered for short periods of service in the Navy for the Summer Manœuvres and for short courses of gunnery and torpedo work in the training establishments; the number appointed in the past year for this purpose was 28 as against 23 in 1889; and others volunteered to come forward, but at the last moment were prevented from taking up their appointments by engagements to their employers. In all there are now on the active list 85, officers Royal Naval Reserve of different grades who have served for various periods in Her Majesty's ships, against 60 at the end of 1889.

Reports on officers, R. N. R. who have served, satisfactory.

Whether in regard to those who have passed through the longer or the shorter course on board Her Majesty's ships, the reports received from those under whom these Royal Naval Reserve officers have served are so satisfactory from a professional point of view, that they justify me in confidently expressing the opinion that this body of officers

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form a valuable and reliable reserve to the Royal Navy; and while the success of this system that has only been in force for a short time is so far assured, it is attended by the additional important advantage of bringing the officers of Her Majesty's Navy in contact with the officers of the Royal Naval Reserve and by the establishment of a feeling of good comradeship. A considerable increase is observed in the entries of engineer officers, Royal Naval Reserve, there being now 87 borne as against 66 at the end of 1889. New regulations have recently been sanctioned and are about to be put in force, the effect of which will to be improve the pay, position, and prospects of the engineers, Royal Naval Reserve, when called out for service, while the qualifications required have been fully maintained.

Engineer officers R.N.R.

As regards the men of the Royal Naval Reserve, they maintain the general standard, both in numbers and efficiency. The full number of first-class Royal Naval Reserve has been maintained, and even exceeded, but all the 1000 second-class Royal Naval Reserve men sanctioned last year have not yet been entered—these men come forward, both for drill and for entry, during the winter months, and no difficulty whatever is to be anticipated in entering full numbers.

Men R.N.R.

The number of firemen Royal Naval Reserve still slowly increases, 583 being borne at end of 1890, against 548 at end of 1889.

Firemen R.N.R.

All the drill ships, and some of the more important Royal Naval Reserve batteries, have been supplied with a modern breech-loading gun for drill purposes, and Nordenfelt guns have recently been added to all drill stations. As guns of modern type become available they will be supplied to all batteries.

Guns for drill purposes for R.N.R.

The following statement shows the progress of the Royal Naval Reserve force in 1890:—

OFFICERS.

Numbers Borne.

Rank.	31st December, 1889.	31st December, 1890.	Estimated for 1891.
Lieutenants	103	141	191
Sub-Lieutenants	202	262	291
Midshipmen	173	194	258
Engineers and Assistant Engineers . .	66	87	105

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	During 1889.	During 1890.
Officers who have completed a year's training :—		
Lieutenants	6	11
Sub-Lieutenants	5	4
Midshipmen	2	1
	13	16
Officers who have completed their training this year or are now under training :—		
Lieutenants	..	2
Sub-Lieutenants	..	14
Midshipmen	..	8
	..	24
Total number of Officers who have been trained or are under training	40	54
Officers not under training who have been through the Excellent or Vernon for a short course of instruction :—		
Lieutenants	6	6
Sub-Lieutenants	1	3
Midshipmen	1	3
	8	12
Officers not under training who served in the Fleet during summer manœuvres only :—		
Lieutenants	5	7
Sub-Lieutenants	7	5
Midshipmen	3	4
	15	16

MEN.

Numbers Borne.

	1889.		1890.	
	Borne.	Allowed.	Borne.	Allowed.
First Class	9,498	9,600	9,817	9,600
Second Class	8,873	9,000	9,243	10,000
Firemen	548	800	583	700
Third Class (Boys)	259	300	238	300

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III.

EXPLANATORY OBSERVATIONS ON THE NAVY ESTIMATES, 1891–92, BY THE FINANCIAL SECRETARY.

Custody of naval ordnance stores.

No alteration has been found necessary in the form or details of the Estimates for the forthcoming financial year, but by arrangements made with the War Office the service connected with the custody, accounts and administration of naval warlike stores is to be undertaken in future by the Admiralty. This involves the provision of £78,800 in the Navy Estimates (Vote 9), which would otherwise have been taken in the Estimates of the War Office.

Vote 1.

Vote 1, Wages to Seamen, has been considerably increased, owing to the additional numbers to be borne, consisting largely of the mechanic and other highly-paid ratings.

Vote 2.

The Victualling Vote (2) is also naturally affected by the increased numbers; and provision has also to be made in this vote for an increase in the value of stocks of clothing, owing to the introduction of an improved and more costly material for seamen's clothing, recommended by the Committee that has been considering the subject.

Appropriations-in-aid.

An addition of £75,400 has been made to the Appropriations-in-Aid, being the difference between the partial cost hitherto borne by Indian Government of vessels stationed in Indian waters, and the full cost of certain vessels which it is proposed shall hereafter be paid by that Government.

Ships built under Imperial Defence Act.

The fleet built under the Imperial Defence Act being now on the eve of completion, some of the vessels having been already commissioned, credit is taken for the full amount of subsidy, payable by the Australasian Colonies, namely, £126,000. The annuity payable under the Act to meet the cost of construction is £69,800.

Expenditure on naval construction.

The amount expended on new construction, which will be detailed in the Navy Expense Accounts in the year 1890–91, is, including armament, estimated at £3,146,938 on the Dockyard Programme, and £3,512,804 on the vessels building by contract.

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In 1891–92 the expenditure is estimated at £3,879,119 for the former, and £3,547,733 for the latter. If the estimated outlay during 1890-91 and 1891–92 should be realised, the total outlay up to 31st March, 1892, on the vessels building under the Naval Defence Act, and in the completion of those in hand prior to 1st April, 1889, will amount to £9,585,168 on dockyard, and £7,930,751 on the contract vessels.

Increase in workmen's wages.

An advance in the wages of the workmen employed in Her Majesty's naval establishments at home has been granted to take effect from the 1st April. This causes an increase of about £78,000 in the several Wages Votes.

Vessels costing in the aggregate £3,214,294 are expected to be completed and added to the effective strength of the Navy during the year ending 31st March next.

The estimated amount to be expended in new construction for the year 1891–92, to maintain the fleet at its standard of strength, as on the 1st April, 1891, is £2,033,703.

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IV.

NAVY ESTIMATES FOR THE YEAR 1891-92.

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IV.—Abstract of Navy

Votes.		Estimates,	
		Gross Estimate.	Appropriations in Aid.
	I.—Numbers.		
A.	Total Number of Officers, Seamen, Boys, Coastguard, and Royal Marines	....	....
	II.—Effective Services.	£	£
1	Wages, &c., of Officers, Seamen and Boys, Coastguard, and Royal Marines	3,564,778	160,778
2	Victualling and Clothing for the Navy . . .	1,475,052	329,252
3	Medical Establishments and Services . . .	142,330	19,630
4	Martial Law	11,715	15
5	Educational Services	96,516	21,016
6	Scientific Services	72,167	10,867
7	Royal Naval Reserves	153,136	36
8	Shipbuilding, Repairs, Maintenance, &c.:		
..	Section I.—Personnel	1,787,420	35,620
..	Section II.—Matériel	2,077,600	214,900
..	Section III.—Contract Work	1,300,400	39,600
9	Naval Armaments	1,595,310	66,610
10	Works, Buildings, and Repairs at Home and Abroad	424,900	7,300
11	Miscellaneous Effective Services	149,709	9,309
12	Admiralty Office	229,620	8,520
	Total Effective Services . . £	13,080,653	923,453
	III.—Non-Effective Services.		
13	Half Pay, Reserved, and Retired Pay. . . .	792,159	12,959
14	Naval and Marine Pensions, Gratuities, and Compassionate Allowances	948,280	23,580
15	Civil Pensions and Gratuities	319,728	528
	Total Non-Effective Services . . £	2,060,167	37,067
	IV.—Extra Estimate for Services in connection with the Colonies.		
16	Additional Naval Force for Service in Australasian Waters—Annuity payable under	69,800	35,000
	Grand Total . . . £	15,210,620	995,520

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Estimates for 1891-92.

1891-92.	Estimates, 1890-91.			Difference on Net Estimates.		Votes.
Net Estimate.	Gross Estimate.	Appropriations in Aid.	Net Estimate.	Increase.	Decrease.	
Total Numbers.			Total Numbers.	Numbers.	Numbers.	
71,000	....	....	68,800	2,200	....	A.
£	£	£	£	£	£	
3,404,000	3,440,023	127,523	3,312,500	91,500	....	1
1,145,800	1,388,186	284,986	1,103,200	42,600	....	2
122,700	144,030	18,830	125,200	....	2,500	3
11,700	11,924	24	11,900	....	200	4
75,500	92,091	20,291	71,800	3,700	....	5
61,300	67,185	9,285	57,900	3,400	....	6
153,100	152,136	36	152,100	1,000	....	7
						8
1,751,800	1,682,750	23,450	1,659,300	92,500	....	Sec. I.
1,862,700	1,854,000	184,000	1,670,000	192,700	....	Sec. II.
1,260,800	1,309,900	9,200	1,300,700	....	39,900	Sec. III.
1,528,700	1,465,100	1,600	1,463,500	65,200	....	9
417,600	453,100	7,300	445,800	....	28,200	10
140,400	136,142	2,742	133,400	7,000	....	11
221,100	229,020	8,520	220,500	600	....	12
12,157,200	12,425,587	697,787	11,727,800	500,200	70,800	
779,200	796,855	3,355	793,500	....	14,300	13
924,700	938,476	5,076	933,400	....	8,700	14
319,200	332,738	2,038	330,700	....	11,500	15
2,023,100	2,068,069	10,469	2,057,600	....	34,500	
34,800	64,200	63,000	1,200	33,600	....	16
14,215,100	14,557,856	771,256	13,786,600	533,800	105,300	
			Net Increase			£428,500*

* This includes a sum of £78,810, estimated cost of the Ordnance Store Service transferred from the War Office to the Admiralty, which would otherwise have been borne on the Army Votes for 1891-92.

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STATEMENT showing the Actual and Estimated EXPENDITURE for NAVAL SERVICES for the Three Years ending the 31st March, 1892.

		£	s.	d.
1889-90	Estimated Expenditure (after deducting Appropriations in Aid)	13,685,400	0	0
	Supplementary Estimate (10th March, 1890)	350,000	0	0
		14,035,400	0	0
	Net Expenditure, as per Final Account	13,643,968	15	0
	Net Surplus (Expenditure less than Estimate)	£391,431	5	0
1890-91	Estimated Expenditure (after deducting Appropriations in Aid)	£13,786,600	0	0
1891-92	Estimated Expenditure (after deducting Appropriations in Aid)	£14,215,100	0	0

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STATEMENT of the Principal Points of DIFFERENCE between the ESTIMATES of 1890–91 and those for 1891–92.

INCREASES.

	£	£
Wages, &c. of Officers, &c.		123,450
Victuals and Clothing (including improved rates of Pay to Artificers and Police in Victualling Yards)		53,620
Educational Services		3,705
Scientific Services		3,400
Royal Naval Reserves		1,000
Wages of Artificers and Police in Dockyards (including £70,000 on account of increased rates of Pay to Artificers)		104,670
Naval Stores (including Coal)		214,450
Decrease in Amount of Receipts arising from the Sale of Old Ships and unserviceable Naval Stores		4,350
Propelling Machinery for Her Majesty's Ships and Vessels (Contract)		38,100
Repairs, &c., of Ships by Contract		13,850
Gun Mountings, &c. (Contract)		14,029
Royal Reserve of Merchant Cruisers		18,150
Naval Armaments:—		
Transfer of Duty from War Department	78,800	
Expenditure on Naval Armaments	51,400	
		130,200
Passage Money, and Pilotage of Her Majesty's Ships		11,000
Annuity to repay Cost of the Australasian Squadron		5,600
Reduction in Amount of Contribution from War Department on account of the Maintenance of Her Majesty's Troop Ships		3,100
Cessation of the Contribution from the Ceylon Government in aid of Naval Expenditure		4,500
Miscellaneous Items		1,446
		748,620

DECREASES.

	£	£
Medical Establishments and Services	1,600	
Auxiliary Machinery for Her Majesty's Ships and Vessels (Contract)	13,960	
Hulls of Ships, &c., Building by Contract	63,550	
Machinery for Shore Establishments (Contract)	16,110	
Sale, &c., of Naval Armament Stores	48,400	
Works, Buildings, and Repairs	28,200	
Non-Effective Services	7,900	
Contribution from the Australasian Colonies towards Cost and Maintenance of Australasian Squadron	63,000	
Contribution from the Indian Government on account of Her Majesty's Ships in Indian Waters	75,400	
Contribution in connection with Expense of Manning the Floating Defences of Indian Harbours	2,000	
		320,120
Net Increase		£ 428,500

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STATEMENT showing the Total Estimated EXPENDITURE for the NAVAL SERVICE, including Amounts provided in the NAVY ESTIMATES, as well as in the CIVIL SERVICE and other ESTIMATES, for the following Services:—

		1891–92.	1890–91.
NAVY ESTIMATES:		£	£
Estimated Expenditure (after deducting Appropriations in Aid)		14,215,100	13,786,600
CIVIL SERVICE ESTIMATES:			
Estimated Expenditure under—			
Class I. Vote 4.—Admiralty, Extension of Buildings		50,000	25,000
„ I. „ 9.—Public Buildings, Great Britain:			
Maintenance and Repairs, including New Works, Alterations, &c.	£ 2,500		
Rents, Insurance, Tithes, &c.	4,000		
Fuel, Light, Water, &c.	3,000		
Furniture	1,400		
		10,900	11,010
Class I. Vote 10.—Surveys of the United Kingdom		100	100
„ I. „ 14.—Rates on Government Property.		52,000	51,000
„ I. „ 15.—Public Buildings, Ireland:			
Coast Guard, viz.:			
New Works and Alterations	£ 11,605		
Maintenance and Supplies	5,637		
Furniture, Fittings, &c.	250		
	£17,492		
Naval Reserve	3,131		
		20,623	13,945
Class II. Vote 13.—Exchequer and Audit Department (Cost of Audit):			
Navy Store and Cash Accounts	£ 8,856		
Expense and Manufacturing Accounts	6,336		
		15,192	14,920
Class II. Vote 23.—Stationery and Printing		50,800	50,570
„ III. „ 1.—Law Charges, England (Net)		2,808	2,840
„ III. „ 8.—Prisons, England:			
Maintenance of Naval Prisoners		1,249	1,214
„ III. „ 14.—Prisons, Scotland		50	50
„ III. „ 21.—Prisons, Ireland		56	59
REVENUE DEPARTMENTS:			
Post Office.—Postage of Official Correspondence	£ 12,580		
„ Official Telegrams	3,300		
		15,880	15,296
GREENWICH HOSPITAL FUNDS		3,173	3,044
Total		14,437,931	13,975,648

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VOTE 8.

SHIPBUILDING, REPAIRS, MAINTENANCE, &c.

I.—ESTIMATE of the SUM which will be required in the YEAR ending 31st March, 1892, to defray the EXPENSES of SHIPBUILDING, REPAIRS, MAINTENANCE, &c., including the COST of ESTABLISHMENTS of DOCKYARDS and NAVAL YARDS at HOME and ABROAD.

DOCKYARD WORK.

SECTION I.—PERSONNEL.—One Million Seven Hundred and Fifty-one Thousand Eight Hundred Pounds.

(£1,751,800.)

SECTION II.—MATERIEL.—One Million Eight Hundred and Sixty-two Thousand Seven Hundred Pounds.

(£1,862,700.)

CONTRACT WORK.

SECTION III.—CONTRACT WORK.—One Million Two Hundred and Sixty Thousand Eight Hundred Pounds.

(£1,260,800.)

II.—SUB-HEADS under which SECTION I., PERSONNEL, of this VOTE will be accounted for.

	ESTIMATES.		Increase.	Decrease.
	1891–92.	1890–91.		
	£	£	£	£
DOCKYARD WORK.				
SECTION I.—PERSONNEL.				
Dockyards at Home.				
A.—Salaries and Allowances . . .	157,333*	158,817	..	1,484
B.—Wages, &c., of Men, and hire of Teams	1,375,973†	1,285,374	90,599	..
C.—Wages, &c., of Police Force . .	38,091	35,722	2,369	..
D.—Contingencies	4,300	4,300	..	..
Naval Yards Abroad.				
E.—Salaries and Allowances . . .	49,879*	48,054	1,825	..
F.—Wages, &c., of Men, and hire of Teams	149,371	138,266	11,105	..
G.—Wages, &c., of Police Force . .	11,596	11,340	256	..
H.—Contingencies	877	877	..	..
£	1,787,420	1,682,750	106,154	1,484
Deduct,—				
I.—Appropriations in Aid . . .	35,620	23,450	12,170	..
£	1,751,800	1,659,300	93,984	1,484
	Net Increase .		£92,500	

* These amounts include the sums of £18,231 and £1,309 for pay of Inspectors of Shipwrights at Home and Abroad respectively, which is charged direct to the cost of shipbuilding.

† This amount includes a sum of £70,000 to defray the cost of a proposed increase of the Wages of Dockyard Artificers, &c., which sum will, when voted, be distributed over the various Ships and Services detailed in the Programme of Works, 1891–92.

NOTE.—Provision has been made for New Construction under the Naval Defence Act, 1889, to the extent of—

Section 1	£835,000
„ 2	824,000
„ 3	991,000
	£2,650,000

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VOTE 8.—SHIPBUILDING, REPAIRS, MAINTENANCE, &c.—*continued.*

II.—SUB-HEADS under which SECTION II., MATERIEL, of this Vote will be accounted for.

	ESTIMATES.		Increase.	Decrease.
	1891-92.	1890-91.		
	£	£	£	£
DOCKYARD WORK—*continued.*				
SECTION II.—MATERIEL.				
Naval Stores.				
A.—Timber, Masts, Deals, &c. . .	113,600	113,200	400	..
B.—Metals and Metal Articles . .	867,929	729,530	138,399	..
C.—Coals for Yard purposes . . .	62,000	56,000	6,000	..
D.—Hemp, Canvas, &c.	100,000	95,000	5,000	..
E.—Paint materials, Oils, Pitch, Tar, Tallow, Boats, Furniture, and other Miscellaneous Articles. . .	300,000	245,000	55,000	..
F.—Electrical, Torpedo, and other Apparatus	70,000	90,000	..	20,000
G.—Coals for Steam Vessels . . .	517,000	480,000	37,000	..
H.—Freight.	28,000	28,000	..	..
I.—Rents, Water, &c., Dockyards at Home, and Naval Yards Abroad . .	8,986	8,955	31	..
K.—Gas, &c., Dockyards at Home, and Naval Yards Abroad . . .	10,085	8,315	1,770	..
£	2,077,600	1,854,000	243,600	20,000
Deduct,—				
L.—Appropriations in Aid . . .	214,900	184,000	30,900	..
£	1,862,700	1,670,000	212,700	20,000
	Net Increase . .		£192,700	

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VOTE 8.—SHIPBUILDING, REPAIRS, MAINTENANCE, &c.—*continued.*

II.—SUB-HEADS under which SECTION III., CONTRACT WORK, of this VOTE will be accounted for.

	ESTIMATES.		Increase.	Decrease.
	1891-92.	1890-91.		
	£	£	£	£
SECTION III.—CONTRACT WORK.				
A.—Propelling Machinery for Her Majesty's Ships and Vessels . .	749,285	711,198	38,087	..
B.—Auxiliary Machinery for Her Majesty's Ships and Vessels . .	60,270	74,230	..	13,960
C.—Hulls of Ships, &c., Building by Contract	73,554	137,101	..	63,547
D.—Purchase of Ships, Vessels, &c. .	..	..	..	..
E.—Repairs and Alterations by Contract of Ships, &c., and their Machinery and Stores	49,400	34,200	15,200	..
F.—Inspection of Contract Work . .	8,650	10,000	..	1,350
G.—Gun Mountings and Air Compressing Machinery	251,000	236,971	14,029	..
H.—Machinery for Her Majesty's Shore Establishments at Home and Abroad	47,891	64,000	..	16,109
I.—Royal Reserve of Merchant Cruisers.	60,350	42,200	18,150	..
£	1,300,400	1,309,900	85,466	94,966
Deduct,—				
K.—Appropriations in Aid . . .	39,600	9,200	30,400	..
£	1,260,800	1,300,700	55,066	94,966
	Net Decrease . .		£39,900	

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VOTE 9.

NAVAL ARMAMENTS.

I.—ESTIMATE of the Sum which will be required in the Year ending the 31st March, 1892, to defray the EXPENSE of NAVAL ARMAMENTS.

One Million Five Hundred and Twenty-eight Thousand Seven Hundred Pounds.

(£1,528,700.)

II.—SUB-HEADS under which this VOTE will be accounted for.

	ESTIMATES.		Increase.	Decrease.
	1891-92.	1890-91.		
	£	£	£	£
A.—Guns	591,500	410,000	181,500	..
B.—Projectiles and Ammunition .	477,000	557,671	..	80,671
C.—Torpedoes and Gun Cotton .	137,000	90,000	47,000	..
D.—Small Arms and Miscellaneous	231,000	292,170	..	61,170
E.—Inspection, &c.	55,000	70,000	..	15,000
EE.—Additional Floating Magazines	..	20,000	..	20,000
F.—Freight and Incidental Charges	25,000	25,259	..	259
G.—Salaries, Wages, Contingencies, &c.	78,810	..	78,810	..
£	1,595,310	1,465,100	307,310	177,100
Deduct,—				
H.—Appropriations in Aid .	66,610	1,600	65,010	..
£	1,528,700	1,463,500	242,300	177,100
	Net increase . . .		£65,200*	

NOTE.—1. This Vote would have shown a decrease of £13,600 had provision not been made for the new Ordnance Store Service transferred from the Army to the extent of £78,810.

2. The sum of £600,000 has been provided in this Estimate for the Armament of Dockyard-Built Vessels, under the provisions of the Naval Defence Act of 1889.

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V.

1891-92.

PROGRAMME OF WORKS IN PROGRESS ON SHIPS BUILDING &c., IN HER MAJESTY'S DOCKYARDS AND BY CONTRACT.

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V.—PROGRAMME of

PROGRAMME of the ESTIMATED EXPENDITURE in CASH, and in NET
REPAIRS, MAINTENANCE, &c.,

SUB-HEADS under which this ESTIMATED EXPENDITURE will be
provisions of Sec. 1 (2), ARMY

	ESTIMATES,				
	Direct Expenditure.				
	Dockyard Work.		Contract Work, Sec. III.	Total.	Under Section I. (3), of Naval Defence Act (1889.)†
	Personnel, Sec. I.	Matériel, Sec. II.			
NEW CONSTRUCTION:	£	£	£	£	£
Dockyard-Built Ships:					
Old Programme (Naval Defence Act, Sec. 3 (1)) . . .	32,740	19,535	51,532	103,807	..
New Programme (Naval Defence Act, Sec. 1 (3))† . . .	697,260	1,016,045	865,799	2,579,104	..
Contract-Built Ships:					
Old Programme (Naval Defence Act, Sec. 3 (1)) . . .	11,200	9,000	71,126	91,326	..
New Programme (Naval Defence Act, Sec. 1 (3),† (Fitting and Equipping at Dockyards) .	51,800	63,840	*39,296	154,936	..
A.—TOTAL	**793,000**	**1,108,420**	**1,027,753**	**2,929,173**	..
Contract-Built Ships:					
B.—New Programme (Naval Defence Act, Sec. 1 (3))†. . . .	..	..	..	..	3,140,733
TOTAL NEW CONSTRUCTION UNDER NAVAL DEFENCE ACT . . .	**793,000**	**1,108,420**	**1,027,753**	**2,929,173**	**3,140,733**
NOTE.—*There is a sum, estimated at £199,873, unexpended, which, subject to adjustment, may be used in aid of the expenditure of 1891-92.*					
C.—NEW VESSELS NOT INCLUDED IN ABOVE, AND TORPEDO AND STEAM BOATS, YARD CRAFT, &c.:					
Dockyard-Built	2,720	940	..	3,660	..
Contract-Built	1,910	1,600	17,000	20,510	..
TOTAL . . .	4,630	2,540	17,000	24,170	..
TOTAL—NEW CONSTRUCTION	797,630	1,110,960	1,044,753	2,953,343	3,140,733
D.—RE-CONSTRUCTION, REPAIRS, ALTERATIONS, &c. . . .	..	..	..	716,406	..
E.—SEA STORES, COALS, &c. .	..	..	..	837,900	..
F.—ESTABLISHMENT, INCIDENTAL, AND MISCELLANEOUS CHARGES, UNAPPROPRIATED .	..	..	..	..	..
				4,507,649	**3,140,733**

NOTE.—The Expenditure upon Armaments, Outfits, and Reserves is given under Vote 9.
* Steamboats for Ships building under the Naval Defence Act.

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VALUES OF STORES issued for SHIPBUILDING, RE-CONSTRUCTION, in the Year 1891–92.

accounted for in the NAVY EXPENSE ACCOUNTS, under the AND NAVY AUDIT ACT, 1889.

1891-92.			1890-91.			Difference between Direct Expenditure, 1890-91 (B) and 1891-92. (A)	
Total Direct Expenditure. (A)	Establishment, &c. Charges apportioned.	Aggregate, 1891-92.	Direct Expenditure. (B)	Establishment, &c. Charges, apportioned.	Aggregate, 1890-91.	Increase.	Decrease.
£	£	£	£	£	£	£	£
103,807	8,230	112,037	321,154	23,825	344,979	..	217,347
2,579,104	227,624	2,806,728	2,406,487	197,486	2,603,973	172,617	..
91,326	3,751	95,077	163,170	4,043	167,213	..	71,844
154,936	16,956	171,892	..	..	..	154,936	..
2,929,173	**256,561**	**3,185,734**					
3,140,733	..	3,140,733	3,595,930	..	3,595,930	..	455,197
6,069,906	**256,561**	**6,326,467**	**6,486,741**	**225,354**	**6,712,095**		
3,660	..	3,660	720	..	720	2,940	..
20,510	723	21,233	63,570	1,281	64,851	..	43,060
24,170	723	24,893	64,290	1,281	65,571		
6,094,076	**257,284**	**6,351,360**	**6,551,031**	**226,635**	**6,777,666**	..	456,955 (Net.)
716,406	73,006	789,412	985,174	100,296	1,085,470	..	268,768
837,900	34,847	872,747	833,000	36,130	869,130	4,900	..
	912,441	912,441	..	937,196	937,196	..	..
7,648,382	**1,277,578**	**8,925,960**	**8,369,205**	**1,300,257**	**9,669,462**		

NET DECREASE ON DIRECT EXPENDITURE . . £720,823.

† Excluding Guns, Torpedoes, and Ammunition.

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SHIPBUILDING, RE-CONSTRUCTION, REPAIRS, MAINTENANCE, &c., ESTIMATED EXPENDITURE.

STATEMENT showing the **Estimated Distribution** of the Aggregate Expenditure in Cash and in Net Values of Stores to be issued from **Stock**, including **Establishment and Incidental Charges**, in connection with the **Programme of Naval Construction, Re-construction, Repairs, and Miscellaneous Services, arranged under the Sub-Heads, &c., under which the Expenditure will be accounted for in the Navy Expense Accounts, under the provisions of Sec. 1 (2), Army and Navy Audit Act, 1889.**

SECTION I.—PERSONNEL. HEADS OF EXPENDITURE.	ESTIMATED EXPENDITURE.		ESTIMATED DISTRIBUTION OF THE DIRECT AND INCIDENTAL EXPENDITURE.									
			Naval Construction.					Manufactures (including Repairs).		Establishment and Incidental Charges Unapportioned to Ships, &c.		
				Re-construction, Repairs, Alterations, and Refits.			Stores for Ships, Coals for Steaming, &c.					Total Amount of Estimated Expenditure.
	Charged direct as Incurred.	Establishment and Incidental Charges Apportioned.	New Construction.	Ships Re-constructing.	Ships for Reliefs or Re-commission.	Ships in Commission and Reserve.		Gun Mountings, Torpedo Carriages, Gear, &c.	Naval Stores, &c.	Fleet, Port, National and Unappropriated Charges.	Unappropriated (Haulbowline, Deptford, and Naval Yards Abroad).	
	(a.)	(b.)	(c.)	(d.)	(e.)	(f.)	(g.)	(h.)	(i.)	(k.)	(l.)	(m.)
DOCKYARD WORK.	£	£	£	£	£	£	£	£	£	£	£	£
SALARIES OF THE DEPARTMENT OF THE CONTROLLER OF THE NAVY (Vote 12) proportion of, attributable to Dockyard Work	..	30,157	11,990	505	674	1,923	2,132	48	275	8,500	4,110	30,157
PENSIONS (Vote 15) ditto ditto	..	6,368	1,199	51	67	192	213	5	28	4,202	411	6,368
TOTAL, ADMIRALTY £	..	36,525	13,189	556	741	2,115	2,345	53	303	12,702	4,521	36,525
DOCKYARDS AT HOME.												
SALARIES AND ALLOWANCES (Vote 8, Sec. 1, Sub-Head A.), Exclusive of Pay of Inspectors, £18,231 (*)	..	139,102	64,344	3,242	4,045	11,762	6,512	140	3,259	42,680	3,118	139,102
EMOLUMENTS PAID OUT OF OTHER VOTES	..	163	..	..	..	..	..	..	..	163	..	163
PENSIONS OF OFFICERS ON THE RETIRED LIST (Vote 15)	..	41,387	6,434	324	405	1,176	651	14	326	31,745	312	41,387
WAGES, &c., OF MEN AND HIRE OF TEAMS:—	£											
Upon — Ships, &c. (Construction, Re-construction, Maintenance, &c.)	1,028,165	1,028,165	..	767,910	47,100	54,000	159,155	..	..	..	..	..	1,324,204
Ships, &c. (New Propelling and other Machinery)	30,000	30,000	..	27,000	3,000	..	..	..	..	..	..	..	
Tugs and Yard Craft (Maintenance)	6,654	6,654	..	..	..	..	6,654	..	..	..	..	..	
Tugs and Yard Craft (Pay, &c. of Crews)	20,605	..	20,605	..	..	..	..	..	..	20,605	..	..	
Manufactures	60,740	60,740	..	..	..	..	..	2,500	58,240	..	..	..	
Yard Services	63,200	..	63,200	12,390	641	784	2,299	1,170	27	657	44,307	925	5,401
Storekeeping	62,126	..	62,126	25,479	613	1,332	3,287	15,059	4	92	10,859	5,401	
Repairs, Storage, &c., of Torpedoes	8,165	..	8,165	..	..	..	..	..	..	..	8,165	..	
Yard Machinery (New)	6,331	..	6,331	2,324	147	158	485	..	7	170	2,800	240	
Yard Machinery (Repairs)	29,218	..	29,218	10,360	653	704	2,161	..	32	758	13,250	1,300	
Experiments	9,000	..	9,000	..	..	..	..	..	..	..	9,000	..	
Total, inclusive of Pay of Inspectors £	(†) 1,324,204											

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CIVIL PENSIONS OF WORKMEN (Vote 15)	..	139,272	30,840	1,943	2,095	6,433	..	97	2,249	95,449	166	139,272
MEDICINES, &c. (Vote 3)	..	225	149	9	10	31	..	1	11	9	5	225
WAGES, &c., OF POLICE FORCE (Vote 8, Sec. 1, Sub-Head C.)	..	38,091	..	..	..	..	..	..	..	37,807	284	38,091
PENSIONS OF POLICE FORCE (Vote 15)	..	3,960	..	..	..	..	..	..	..	3,960	..	3,960
CONTINGENCIES, DOCKYARDS AT HOME (Vote 8, Sec. 1, Sub-Head D.)	..	4,300	1,801	78	108	303	285	3	69	1,493	160	4,300
TOTAL, DOCKYARDS AT HOME £	1,125,559	565,145	949,031	57,750	63,641	193,746	23,677	2,825	65,831	322,293	11,911	1,690,704
NAVAL YARDS ABROAD.												
SALARIES AND ALLOWANCES (Vote 8, Sec. 1, Sub-Head E.), Exclusive of Pay of Inspectors, £1,310. (*)	..	48,569	..	..	..	..	..	..	..	..	48,569	48,569
EMOLUMENTS PAID OUT OF OTHER VOTES	..	1,525	..	..	..	..	..	..	..	..	1,525	1,525
PENSIONS OF OFFICERS ON THE RETIRED LIST (Vote 15)	..	6,002	..	..	..	..	..	..	..	..	6,002	6,002
WAGES, &c., OF MEN AND HIRE OF TEAMS — £												
Upon: Ships, &c.—Construction, Maintenance, &c. 72,029	72,029	..	2,720	..	32,850	36,459	..	..	..	..	..	150,681
Upon: Tugs and Yard Craft (Maintenance 3,970 / Pay, &c., of Crews 8,000)	3,970	8,000	..	..	..	3,970	..	..	..	..	8,000	
Upon: *Manufactures* 6,694	6,694	..	..	..	..	..	..	..	6,694	..	..	
Upon: Yard Services 19,000	..	19,000	..	..	..	..	..	..	..	..	19,000	
Upon: Storekeeping 22,433	..	22,433	..	..	..	..	..	..	..	..	22,433	
Upon: Repairs, Storage, &c., of Torpedoes 3,820	..	3,820	..	..	..	..	..	..	..	..	3,820	
Upon: Yard Machinery (New 2,183 / Repairs 12,552)	..	12,552	..	..	..	..	..	..	..	..	12,552	
Total, inclusive of Pay of Inspectors. £(†) 150,681												
CIVIL PENSIONS OF WORKMEN, &c. (Vote 15)	..	4,274	..	..	..	..	..	..	..	..	4,274	4,274
MEDICINES, &c. (Vote 3)	..	42	..	..	..	..	..	..	..	..	42	42
WAGES, &c., OF POLICE FORCE (Vote 8, Sec. 1, Sub-Head G.)	..	11,596	..	..	..	..	..	..	..	..	11,596	11,596
PENSIONS OF POLICE FORCE (Vote 15)	..	44	..	..	..	..	..	..	..	..	44	44
CONTINGENCIES (Vote 8, Sec. 1, Sub-Head H.)	..	877	..	..	..	..	..	..	..	..	877	877
TOTAL, NAVAL YARDS ABROAD £82,693	140,917	2,720	..	32,850	40,429	..	..	6,694	..	140,917	223,610
TOTAL YARDS AT HOME AND ABROAD, &c. £1,208,252	742,587	964,940	58,306	97,232	236,290	26,022	2,878	72,828	334,994	157,349	1,950,839
Deduct,— Value of Labour expended upon the Manufacture of Stores, and included in the issuing prices thereof under "Matériel" (Section 2)	*67,434*		..	..	..	..	..	*2,500*	*64,934*	..	..	*67,434*
TOTAL, carried to **RECAPITULATION**, p. 400 £1,140,818	742,587	964,940	58,306	97,232	236,290	26,022	‡ 378	‡ 7,894	§334,994	157,349	1,883,405

* Pay of Inspectors of Shipwrights included in the "Wages, &c., of Men, &c.," and distributed as direct charges.
† Exclusive of Expenditure for Indian and Colonial Governments, &c., on repayment as incurred.
‡ Proportion of Establishment, &c., Charges incidental to Manufactures which cannot be included in the issuing prices, *vide* Sec. 6 (1) of Naval Defence Act.
§ The Indirect Expenditure appertaining to Ships constructing by Contract under the Naval Defence Act is included under the "Unappropriated Charges."
NOTE.—The above amounts for Labour are exclusive of a sum of £70,000 to defray the cost of the proposed increase of the wages of Dockyard artificers, &c., which sum will, when voted, be distributed over the various ships and services detailed.

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ESTIMATED EXPENDITURE—*continued.*

SECTION II.—MATÉRIEL.

HEADS OF EXPENDITURE.			ESTIMATED EXPENDITURE. Charged direct as Incurred. (a.)	Establishment and Incidental Charges Apportioned. (b.)
DOCKYARD WORK.				
DOCKYARDS AT HOME.				
NAVAL STORES, &c., TO BE WITHDRAWN FROM STOCK (NET):—		£	£	£
For Supplies to and Work upon . .	Ships, &c. Construction, Re-construction, Maintenance, &c. .	1,455,001	1,455,001	..
	Ships, &c. New Propelling and other Machinery . . .	37,500	37,500	..
	Ships, &c. Coals for Steaming. . .	101,400	101,400	..
	Tugs and Yard Craft, Maintenance . .	7,280	7,280	..
	Yard Services	28,300	..	28,300
	Storekeeping	25,277	..	25,277
	Repairs, Storage, &c., of Torpedoes . .	1,640	..	1,640
	Yard Machinery . . New . .	3,982	..	3,982
	Yard Machinery . . Repairs . .	10,842	..	10,842
	Experiments	10,500	..	10,500
	Total . . . . . £	1,681,722*		
FREIGHT, &c. (Vote 8, Sec. 2, Sub-Head H.)			..	4,600
RENTS, WATER, &c. (Vote 8, Sec. 2, Sub-Head I.)			..	7,531
GAS, &c. (Vote 8, Sec. 2, Sub-Head K.).			..	9,990
BUILDINGS, DOCKS, &c., New Works and Maintenance, Vote 10 . .			..	153,755
TOTAL, DOCKYARDS AT HOME . . . . £			1,601,181	256,417
NAVAL YARDS ABROAD.				
NAVAL STORES, &c., TO BE WITHDRAWN FROM STOCK (NET):—		£		
For Supplies to and Work upon . .	Ships, &c. Construction, Maintenance, &c.	184,672	184,672	..
	Ships, &c. Coals for Steaming. .	372,600	372,600	..
	Tugs and Yard Craft, Maintenance . .	4,823	4,823	..
	Yard Services	12,500	..	12,500
	Storekeeping	3,376	..	3,376
	Repairs, Storage, &c., of Torpedoes . .	922	..	922
	Yard Machinery . . New . .	1,769	..	1,769
	Yard Machinery . . Repairs . .	4,104	..	4,104
	Total . . . . . £	584,766*		
FREIGHT, &c. (Vote 8, Sec. 2, Sub-Head H.).			..	23,400
RENTS, WATER, &c. (Vote 8, Sec. 2, Sub-Head I.)			..	2,111
GAS, &c. (Vote 8, Sec. 2, Sub-Head K.).			..	895
BUILDINGS, DOCKS, &c., New Works and Maintenance, Vote 10 . .			..	84,440
TOTAL, NAVAL YARDS ABROAD . . £			562,095	133,517
TOTAL YARDS AT HOME AND ABROAD . . £			2,163,276	389,934
Add,—				
NEW YARD MACHINERY Purchased by **CONTRACT** . . . . . Dockyards at Home . .			..	..
CONTRACT . . . . . Naval Yards Abroad . .			..	..
TOTAL, carried to **RECAPITULATION**, p. 400 . . £			2,163,276	389,934

* Exclusive of an Estimated Expenditure of £138,350 for other Departments of the Home Government, Indian, Colonial, and Foreign Governments, and Miscellaneous, on repayment; and of Stores to be sold, included in the Appropriations-in-Aid of Vote 8, Section 2.

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Shipbuilding, Re-construction, Repairs, Maintenance, &c.

Section II.—Matériel.

ESTIMATED DISTRIBUTION OF THE DIRECT AND INCIDENTAL EXPENDITURE.

Naval Construction.					Manufactures (including Repairs).		Establishment and Incidental Charges Unapportioned to Ships, &c.		
	Re-construction, Repairs, Alterations, and Refits.								
New Construction.	Ships Re-constructing.	Ships for Reliefs or Re-commission.	Ships in Commission and Reserve.	Stores for Ships and Coals for Steaming, &c.	Gun Mountings, Torpedo Carriages, Gear, &c.	Naval Stores, &c.	Fleet, Port, National, and Unappropriated Charges.	Unappropriated Charges (Haulbowline, Deptford, and Naval Yards Abroad.)	Total Amount of Estimated Expenditure.
(c.)	(d.)	(e.)	(f.)	(g.)	(h.)	(i.)	(k.)	(l.)	(m.)
£	£	£	£	£	£	£	£	£	£
1,074,020	14,800	38,110	88,071	240,000	..	..	..	..	1,455,001
36,000	1,500	..	..	..	..	..	..	..	37,500
..	..	..	..	101,400	..	..	..	..	101,400
..	..	..	4,280	3,000	..	..	..	..	7,280
3,735	200	240	705	312	9	209	22,331	559	28,300
7,540	330	454	1,277	3,023	13	293	7,746	4,601	25,277
..	..	..	..	..	..	..	1,640	..	1,640
1,474	93	100	308	..	5	108	1,774	120	3,982
3,792	239	258	791	..	12	278	4,912	560	10,842
..	..	..	..	..	..	..	10,500	..	10,500
1,919	42	98	239	629	..	..	148	1,525	4,600
3,274	142	197	551	518	5	124	2,720	..	7,531
4,346	188	261	731	687	7	165	3,605	..	9,990
34,982	1,748	2,193	6,365	3,656	75	1,746	96,105	6,885	153,755
1,171,082	**19,282**	**41,911**	**103,318**	**353,225**	**126**	**2,923**	**151,481**	**14,250**	**1,857,598**
940	..	31,600	32,332	119,800	..	..	..	..	184,672
..	..	..	..	372,600	..	..	..	..	372,600
..	..	..	3,723	1,100	..	..	..	..	4,823
..	..	..	..	..	..	..	..	12,500	12,500
..	..	..	..	..	..	..	..	3,376	3,376
..	..	..	..	..	..	..	..	922	922
..	..	..	..	..	..	..	..	1,769	1,769
..	..	..	..	..	..	..	..	4,104	4,104
..	..	..	..	..	..	..	..	23,400	23,400
..	..	..	..	..	..	..	..	2,111	2,111
..	..	..	..	..	..	..	..	895	895
..	..	..	..	..	..	..	..	84,440	84,440
940	..	**31,600**	**36,055**	**493,500**	..	..	..	**133.517**	**695,612**
1,172,022	**19,282**	**73,511**	**139,373**	**846,725**	**126**	**2,923**	**151,481**	**147,767**	**2,553,210**
13,286	837	903	2,771	..	42	973	18,710	..	See Section 3 on following page.
..	..	..	..	..	..	..	..	8,451	
1,185,308	**20,119**	**74,414**	**142,144**	**846,725**	**168***	**3,896***	**170,191**	**156,218**	**2,553,210**

* Proportion of Establishment, &c., Charges incidental to Manufactures which cannot be included in the Issuing Prices, *vide* Section 6 (1) of Naval Defence Act.

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SHIPBUILDING, RE-CONSTRUCTION, REPAIRS, MAINTENANCE, &c.

SECTION III.—CONTRACT WORK.

HEADS OF EXPENDITURE.	ESTIMATED EXPENDITURE. Charged direct as Incurred. (a.)	Establishment and Incidental Charges Apportioned. (b.)
CONTRACT WORK.	£	£
SALARIES OF THE DEPARTMENT OF THE CONTROLLER OF THE NAVY (Vote 12), proportion of, attributable to Contract Work . .	..	25,605
PENSIONS (Vote 15) ditto ditto . .	..	2,561
PROPELLING AND OTHER MACHINERY FOR HER MAJESTY'S SHIPS AND VESSELS (Vote 8, Sec. 3, Sub-Head A.)	749,285	..
OTHER (AUXILIARY) MACHINERY, NOT INCLUDED IN THE CONTRACT PRICE OF SHIPS OR PROPELLING MACHINERY . .	60,527*	..
HULLS OF SHIPS, &c., BUILDING BY CONTRACT (Vote 8, Sec. 3, Sub-Head C.)	73,554	..
PURCHASE OF SHIPS, VESSELS, &c. (Vote 8, Sec. 3, Sub-Head D.) .	..	..
REPAIRS AND ALTERATIONS OF SHIPS, &c., THEIR MACHINERY, AND STORES (Vote 8, Sec. 3, Sub-Head E.)	49,400	..
INSPECTION OF CONTRACT WORK (Vote 8, Sec. 3, Sub-Head F.). .	..	8,650
GUN MOUNTINGS AND TORPEDO CARRIAGES AND GEAR . .	270,789*	..
YARD MACHINERY FOR HER MAJESTY'S SHORE ESTABLISHMENTS (Vote 8, Sec. 3. Sub-Head H.):		
Dockyards at Home	..	37,522
Naval Yards Abroad	..	8,451
Victualling Yards, &c.	..	1,918
ROYAL RESERVE OF MERCHANT CRUISERS (Vote 8, Sec. 3, Sub-Head I.)	..	60,350
TOTAL Section 3 carried to **RECAPITULATION** on p. 400 £	1,203,555	145,057

* Including £24,300 and £110,158, respectively, payments to be made during the Year for Auxiliary Machinery, Hydraulic Mountings, &c., for Specific Ships; and £36,227 and £160,631, value of transferable Auxiliary Machinery, Gun Mountings, &c., to be issued from Store. The cost of altering, &c., transferable Gun Mountings, &c., is included under Sections 1 and 2.

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ESTIMATED EXPENDITURE—*continued.*

SECTION III.—CONTRACT WORK.

ESTIMATED DISTRIBUTION OF THE DIRECT AND INCIDENTAL EXPENDITURE.

Naval Construction.				Stores for Ships, Coals for Steaming, &c.	Establishment and Incidental Charges Unappportioned to Ships, &c.		Total Amount of Estimated Expenditure.	Liabilities for future Years.
	Re-construction, Repairs, Alterations, and Refits.							
New Construction.	Ships Re-constructing.	Ships for Reliefs or Re-commission.	Ships in Commission and Reserve.		Fleet, Port, National, and Unappropriated Charges.	Unappropriated Charges (Haulbowline, Deptford, and Naval Yards Abroad).		
(c.)	(d.)	(e.)	(f.)	(g.)	(h.)	(i.)	(k.)	(l.)
£	£	£	£	£	£	£	£	£
7,380	262	128	485	..	17,350†	..	25,605	..
738	26	13	49	..	1,735†	..	2,561	..
711,585	37,700	..	..	..	..	..	749,285	385,768
32,000	..	5,150	23,377	..	..	..	60,527	10,400
73,554	..	..	..	..	..	..	73,554	..
..	..	..	..	..	..	..	..	..
..	..	..	49,400	..	..	..	49,400	..
7,508	358	103	681	..	..	..	8,650	..
227,614	12,053	9,176	21,946	..	..	..	270,789	263,814
For Apportionment, *see* Section II.				..	..	..	37,522 8,451	..
..	..	..	..	..	1,918	..	1,918	..
..	..	..	..	..	60,350	..	60,350	87,750
1,060,379	50,399	14,570	95,938	..	81,353	..	1,348,612	747,732

† Due to Ships building by Contract under the Naval Defence Act.

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RECAPITULATION OF ESTIMATED EXPENDITURE.

HEADS OF EXPENDITURE.	ESTIMATED EXPENDITURE.		ESTIMATED DISTRIBUTION OF THE DIRECT AND INCIDENTAL EXPENDITURE.								
			Naval Construction.				Stores for Ships, Coals for Steaming, &c.	Establishment and Incidental Charges Unapportioned to Ships, &c.		Total Amount of Estimated Expenditure.	Liabilities for future Years.
	Charged direct as Incurred.	Establishment and Incidental Charges Apportioned.	New Construction.	Re-construction, Repairs, Alterations, and Refits.				Fleet, Port, National, and Unappropriated Charges.	Unappropriated Charges (Haulbowline, Deptford, and Naval Yards Abroad).		
				Ships Re-constructing.	Ships for Reliefs, or Re-commission.	Ships in Commission and Reserve.					
	(a.)	(b.)	(c.)	(d.)	(e.)	(f.)	(g.)	(h.)	(i.)	(k.)	(l.)
SUB-HEADS OF EXPENDITURE.			**A. and C.**	**D.**			**E.**	**F.**			
	£	£	£	£	£	£	£	£	£	£	£
SECTION I.—DOCKYARD WORK—**PERSONNEL**	1,140,818	742,587	964,940	58,306	97,232	236,290	26,022	334,994 / 8,272*	157,349	1,883,405	..
SECTION II.—DOCKYARD WORK—**MATERIEL**	2,163,276	389,934	1,185,308	20,119	74,414	142,144	846,725	170,191 / 4,064*	156,218	2,553,210	..
SECTION III.—CONTRACT WORK	1,203,555	145,057	1,060,379	50,399	14,570	95,938	..	81,353	..	1,348,612	..
TOTAL ESTIMATED EXPENDITURE for 1891-92 £	4,507,649	1,277,578	3,210,627	128,824	186,216	474,372	872,747	598,874	313,567	5,785,227	
TOTALS OF SUB-HEADS £	5,785,227		3,210,627	789,412			**872,747**	**912,441**		**5,785,227**	
Add,—B. **NEW CONSTRUCTION**, by Contract, provided for under Naval Defence Act, Section 1 (3) (*a*)			3,140,733								
TOTAL NEW CONSTRUCTION			**£6,351,360**								

* Proportion of Establishment, &c., Charges incidental to Manufactures, which cannot be included in the Issuing Prices, *vide* Section 6 (1) of Naval Defence Act.

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NEW CONSTRUCTION.

EXPENDITURE TO 31ST MARCH, 1890.

ESTIMATED EXPENDITURE IN 1890-91.

UNEXPENDED BALANCES IN 1890-91 CARRIED FORWARD TO 1891-92, UNDER NAVAL DEFENCE ACT,

ETC., ETC.

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NEW CONSTRUCTION.—STATEMENT showing CUMULATIVE EXPENDITURE to 31st ESTIMATED BALANCES UNEXPENDED in 1890-91; ESTIMATED EXPENDITURE for

	ACTUAL EXPENDITURE to 31st March, 1890.				
	Charged Direct.				Proportion of Establishment, &c., Charges.
	Dockyard Work.		Contract Work.	Total.	
	Labour.	Materials.			
DOCKYARD BUILT SHIPS:	£	£	£	£	£
Old Programme (Naval Defence Act, Sect. 3 (1))	487,800	627,313	500,485	1,615,598	157,633
New Programme (Naval Defence Act, Sect. 1 (3)(*b*))	311,363	708,350	156,879	1,176,592	116,689
CONTRACT BUILT SHIPS:					
Old Programme (Naval Defence Act, Sect. 3 (1))	16,387	20,823	991,062	1,028,272	18,576
New Programme (Naval Defence Act, Sect 1 (3) (*b*), (Fitting and Equipping at Dockyards))	391	43	..	434	82
A.—TOTAL	..	..	..	..	..
CONTRACT BUILT SHIPS:					
B.—New Programme (Naval Defence Act, Sect. 1 (3))	..	..	618,954	618,954	..
TOTAL NEW CONSTRUCTION UNDER NAVAL DEFENCE ACT . . .	..	..	..	..	..
C.—NEW VESSELS NOT INCLUDED IN ABOVE, AND TORPEDO AND STEAM BOATS, YARD CRAFT, &c.:					
Dockyard Built	..	..	..	..	..
Contract Built	..	..	..	..	..
TOTAL	815,941	1,356,529	2,267,380	4,439,850	292,980
SHIPS OF AUSTRALASIAN SQUADRON BUILDING UNDER IMPERIAL DEFENCE ACT, 1888:					
Contract Built	..	..	556,202	556,202	..
GRAND TOTAL—NEW CONSTRUCTION .	815,941	1,356,529	2,823,582	4,996,052	292,980

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March, 1890; EXPENDITURE (as Estimated and Probable) in Year 1890–91; 1891–92; ESTIMATED TOTAL CUMULATIVE EXPENDITURE to 31st March, 1892.

PROBABLE EXPENDITURE and ESTIMATED BALANCES UNEXPENDED during the Year 1890-91.
(Original Estimates for the Year in *Italics*.)

Charged Direct.				Proportion of Establishment, &c., Charges.	Estimated Balances Unexpended in 1890-91.			
Dockyard Work.		Contract Work.	Total.		Dockyard Work.		Contract Work.	Total.
Labour.	Materials.				Labour.	Materials.		
£	£	£	£	£	£	£	£	£
122,791	63,869	133,463	320,123	32,109				
89,290	*49,040*	*182,284*	*321,154*	*23,825*				
561,511	906,222	727,783	2,195,516	183,754				
600,400	*942,360*	*863,727*	*2,406,487*	*197,486*	..	..	199,873	199,873
12,408	10,889	131,802	155,099	4,906				
8,200	*8,600*	*146,370*	*163,170*	*4,043*				
1,180	19,020	..	20,200	1,600				
697,890	1,000,000	993,048	2,690,938					
697,890	*1,000,000*	*1,192,921*	*2,890,811*					
..	..	2,950,036	2,950,036					
..	..	*3,595,930*	*3,595,930*					
697,890	1,000,000	3,943,084	5,640,974					
697,890	*1,000,000*	*4,788,851*	*6,486,741*					
310	1,560	..	1,870					
260	*460*	..	*720*					
1,740	1,000	24,747	27,487	762				
1,740	*1,540*	*60,290*	*63,570*	*1,281*				
699,940	1,002,560	3,967,831	5,670,331	223,131				
699,890	*1,002,000*	*4,849,141*	*6,551,031*	*226,635*				
..	..	158,798	158,798	..				
..	..	*119,516*	*119,516*	..				
699,940	**1,002,560**	**4,126,629**	**5,829,129**	**223,131**				
699,890	*1,002,000*	*4,968,657*	*6,670,547*	*226,635*				

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NEW CONSTRUCTION.—STATEMENT showing CUMULATIVE EXPENDITURE to 31st ESTIMATED BALANCES UNEXPENDED in 1890-91; ESTIMATED EXPENDITURE for

	ESTIMATED EXPENDITURE for the Year 1891-92.				
	Charged Direct.				Proportion of Establishment, &c. Charges.
	Dockyard Work.		Contract Work.	Total.	
	Labour.	Materials.			
DOCKYARD BUILT SHIPS:	£	£	£	£	£
Old Programme (Naval Defence Act, Sect. 3 (1)).	32,740	19,535	51,532	103,807	8,230
New Programme (Naval Defence Act, Sect. 1 (3)(*b*))	697,260	1,016,045	865,799	2,579,104	227,624
CONTRACT BUILT SHIPS:					
Old Programme (Naval Defence Act, Sect. 3 (1)).	11,200	9,000	71,126	91,326	3,751
New Programme (Naval Defence Act, Sect. 1 (3) (*b*)) (Fitting and Equipping at Dockyards)	51,800	63,840	*39,296	154,936	16,956
TOTAL	793,000	1,108,420	1,027,753	2,929,173	256,561
CONTRACT BUILT SHIPS:					
New Programme (Naval Defence Act, Sect. 1 (3))	..	..	3,140,733	3,140,733	..
TOTAL NEW CONSTRUCTION UNDER NAVAL DEFENCE ACT . . .	793,000	1,108,420	4,168,486	6,069,906	
NEW VESSELS NOT INCLUDED IN ABOVE, AND TORPEDO AND STEAM BOATS, YARD CRAFT, &c.:					
Dockyard Built	2,720	940	..	3,660	..
Contract Built	1,910	1,600	17,000	20,510	723
TOTAL	797,630	1,110,960	4,185,486	6,094,076	257,284
SHIPS OF AUSTRALASIAN SQUADRON BUILDING UNDER IMPERIAL DEFENCE ACT, 1888:					
Contract Built	..	..	..	..	..
GRAND TOTAL—NEW CONSTRUCTION .	797,630	1,110,960	4,185,486	6,094,076	257,284

* Steamboats for ships building under the Naval Defence Act.
† Includes £4,812, estimated value of Reserve Gun Mountings.

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March, 1890; EXPENDITURE (as Estimated and Probable) in Year 1890–91; 1891–92; ESTIMATED TOTAL CUMULATIVE EXPENDITURE to 31st March, 1892.

ESTIMATED TOTAL EXPENDITURE to 31st March, 1892.					TOTAL EXPENDITURE UNDER NAVAL DEFENCE ACT, excluding Armament and Establishment Charges (New Programme Ships).			
Charged Direct.				Proportion of Establishment, &c. Charges.	Dockyard-Built Ships ‡ (Naval Defence Act, Sect. 1 (3)) (*b*).		Contract-Built Ships (Naval Defence Act, Sect. 1 (3)) (*a*).	
Dockyard Work.		Contract Work.	Total.		Probable Actual to 31 March, 1891.	Estimated for 1891–92.	Probable Actual to 31 March, 1891.	Estimated for 1891–92.
Labour.	Materials.							
£	£	£	£	£	£	£	£	£
643,331	710,717	685,480	2,039,528	197,972	..	..	..	..
1,570,134	2,630,617	1,750,461	5,951,212	528,067	3,372,108	2,579,104	..	..
39,995	40,712	1,193,990	1,274,697	27,233	..	..	..	..
53,371	82,903	39,296	175,570	18,638	‡20,634	‡154,936	..	..
					..	..	..	..
..	..	6,709,723	6,709,723	..	..	..	3,568,990	3,140,733
					..	..	..	..
..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..
2,306,831	3,464,949	10,378,950	16,150,730	771,910	3,392,742	2,734,040	3,568,990	3,140,733
					6,126,782		6,709,723	
..	..	†715,000	†715,000	..	. . . . .		. . . . .	
2,306,831	**3,464,949**	**11,093,950**	**16,865,730**	**771,910**	. . . . .		. . . . .	

‡ The cost of equipping and completing for sea in Her Majesty's Dockyards, the Ships Building by Contract under the Naval Defence Act. *Vide* Clause 1 (3) (*b*), is included under this Heading.
NOTE.—The Estimated Liability for future years is shown for each Ship in Programme.

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DESCRIPTION OF EXPENDITURE.	ESTIMATED DOCKYARD WORK. Labour Expended. Dockyards at Home.	Labour Expended. Dockyards Abroad.	Net Value of Materials Issued. Dockyards at Home.	Net Value of Materials Issued. Dockyards Abroad.
	£	£	£	£
NEW CONSTRUCTION:				
Dockyard-Built Ships:				
OLD PROGRAMME.				
Armoured	2,700	..	1,035	..
Protected	30,040	..	18,500	..
Unprotected	..	..	..	..
Total	32,740	..	19,535	..
NEW PROGRAMME.				
Armoured	289,000	..	635,300	..
Protected	354,258	..	355,880	..
Unprotected	54,002	..	24,865	..
Total	697,260	..	1,016,045	..
Contract-Built Ships:				
OLD PROGRAMME.				
Armoured	..	..	..	..
Protected	11,200	..	9,000	..
Unprotected	..	..	..	..
Total	11,200	..	9,000	..
NEW PROGRAMME.				
Armoured	..	..	..	..
Protected	51,800	..	63,840	..
Unprotected	..	..	..	..
Total	51,800	..	63,840	..
NEW VESSELS NOT INCLUDED IN ABOVE, AND TORPEDO STEAM-BOATS, YARD CRAFT, &c.				
Dockyard-Built	..	2,720	..	940
Contract-Built.	1,910	..	1,600	..
Total	1,910	2,720	1,600	940
RE-CONSTRUCTION	50,100	..	16,300	..
REPAIRS, ALTERATIONS, AND REFITS TO SHIPS FOR RELIEFS OR RE-COMMISSION	54,000	32,850	38,110	31,600
REPAIRS TO SHIPS IN COMMISSION AND RESERVE	165,809	40,429	92,351	36,055
TOTAL RE-CONSTRUCTION, REPAIRS, &c. (excluding Establishment, &c., Charges)	**269,909**	73,279	146,761	67,655
TOTAL NEW CONSTRUCTION,* RE-CONSTRUCTION, REPAIRS, &c. (excluding Establishment, &c., Charges) (Carried forward).	**1,064,819**	75,999	1,256,781	68,595

* Exclusive of estimated expenditure upon contract work under Section 1, (3) of the Naval Defence Act, and under the Imperial Defence Act.

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EXPENDITURE DURING 1891–92.

CONTRACT WORK, &c.							GRAND TOTAL, DOCKYARD AND CONTRACT WORK.
Propelling and other Machinery.	Hulls, &c., Building by Contract.	Purchase of Ships and Vessels.	Repairs, &c., by Contract.	Inspection of Contract Work.	Gun Mountings and Torpedo Gear.	TOTAL.	
£	£	£	£	£	£	£	£
..	..	..	..	..	..	..	..
34,528	..	..	..	..	14,004	48,532	..
3,000	..	..	..	..	..	3,000	..
37,528	..	..	..	..	14,004	51,532	103,807
229,722	..	..	..	..	87,000	316,722	..
311,814	..	..	..	..	104,962	416,776	..
113,918	†11,370	..	..	..	7,013	132,301	..
655,454	11,370	..	..	..	198,975	865,799	2,579,104
..	..	..	..	..	..	..	..
18,791	37,700	..	..	..	14,635	71,126	..
..	..	..	..	..	..	..	..
18,791	37,700	..	..	..	14,635	71,126	91,326
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
†22,812	†16,484	..	..	..	..	39,296	..
22,812	16,484	..	..	..	..	39,296	154,936
..	..	..	..	..	..	..	..
9,000	8,000	..	..	..	..	17,000	..
9,000	8,000	..	..	..	..	17,000	24,170
37,700	..	..	..	..	12,053	49,753	116,153
5,150	..	..	..	..	9,176	14,326	170,886
23,377	..	..	49,400	..	21,946	94,723	429,367
66,227	..	..	**49,400**	..	**43,175**	**158,802**	**716,406**
809,812	**73,554**	..	**49,400**	..	**270,789**	**1,203,555**	**3,669,749**

† Steamboats for Ships building under Naval Defence Act.

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GENERAL SUMMARY of the Estimated DIRECT and INDIRECT REPAIRS, &c., and other

DESCRIPTION OF EXPENDITURE.	ESTIMATED			
	DOCKYARD WORK.			
	Labour Expended.		Net Value of Materials Issued.	
	Dockyards at Home.	Dockyards Abroad.	Dockyards at Home.	Dockyards Abroad.
	£	£	£	£
TOTAL NEW CONSTRUCTION* (Brought forward)	**1,064,819**	**75,999**	**1,256,781**	**68,595**
SEA STORES FOR SHIPS	..	..	243,000	120,900
COALS FOR STEAMING	..	..	101,400	372,600
TOTAL SEA STORES, &c., &c.	..	..	**344,400**	**493,500**
TOTAL DIRECT EXPENDITURE	**1,064,819**	**75,999**	**1,601,181**	**562,095**
Manufactures	60,740	6,694	..	..
ESTABLISHMENT AND INCIDENTAL CHARGES, LABOUR, MATERIALS, &c.:				
Apportioned to Ships	80,046	..	24,871	..
Apportioned to Manufactures	1,747	..	927	..
Unapportioned	116,852	67,988	54,743	22,671
TOTAL ESTABLISHMENT AND INCIDENTAL CHARGES, LABOUR, MATERIALS, &c.	**198,645**	**67,988**	**80,541**	**22,671**
GRAND TOTAL—LABOUR, MATERIALS, AND CONTRACT WORK	(a) **1,324,204**	**150,681**	**1,681,722**	**584,766**
Add,— **ESTABLISHMENT AND INCIDENTAL CHARGES, OTHER THAN LABOUR, MATERIALS, &c.:**				
Apportioned to Ships	..	..	..	..
Apportioned to Manufactures	..	..	..	..
Unapportioned	..	..	..	..
Deduct,— Value of Labour expended upon Manufacture of Stores included in values of Materials issued	..	..	..	..
GRAND TOTAL OF ESTIMATED EXPENDITURE	..	..	..	..

* Exclusive of £3,140,733, the estimated expenditure upon contract work under Section 1, (3) (a) of the Naval Defence Act.

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EXPENDITURE upon NEW CONSTRUCTION, RE-CONSTRUCTION, SERVICES, for the Year 1891–92—*continued.*

EXPENDITURE DURING 1891–92.

CONTRACT WORK, &c.							GRAND TOTAL.
Propelling and other Machinery.	Hulls, &c., Building by Contract.	Purchase of Ships and Vessels.	Repairs, &c., by Contract.	Inspection of Contract Work.	Gun Mountings and Torpedo Gear.	Total.	
£	£	£	£	£	£	£	£
809,812	**73,554**	..	**49,400**	..	**207,789**	**1,203,555**	**3,669,749**
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	**837,900**
809,812	**73,554**	..	**49,400**	..	**270,789**	**1,203,555**	**4,507,649**
..	..	..	..	..	..	..	67,434
..	..	..	..	8,650	..	8,650	..
..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..
..	..	..	..	**8,650**	..	**8,650**	**378,495**
809,812	**73,554**	..	**49,400**	**8,650**	**270,789**	**1,212,205**	**4,953,578**

..	..	..	..	..	..	..	..	..	..	..		251,570
..	..	..	..	..	..	..	..	..	..	..		9,662
..	..	..	..	..	..	..	..	..	..	..		637,851
												5,852,661
..	..	..	..	..	..	..	..	..	..	..		*67,434*
..	..	..	..	..	..	..	..	..	..	..	£	**5,785,227**

	Dockyards.	
	At Home.	Abroad.
	£	£
(*a*) Total Vote 8, Sect. 1, Sub-heads B and F.	1,305,973	149,371
Add,—		
Salaries of Inspectors of Shipwrights .	18,231	1,310
Total . . .	£1,324,204	150,681

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SUMMARY of SHIPS BUILDING, COMPLETING, and to be Commenced in

CLASS OF SHIP.	PORTSMOUTH.			DEVONPORT.			CHATHAM.			SHEERNESS.		
	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.
OLD PROGRAMME:												
ARMOURED:												
Battle Ships, 1st Class	1	..	..	..	..	..	..	..	..	..	..	..
Battle Ships, 2nd Class	..	..	..	..	..	..	..	..	..	..	..	..
Cruisers, 1st Class	..	..	..	..	..	..	..	..	..	..	..	..
Total	1	..	..	..	..	..	..	..	..	..	..	..
PROTECTED:												
Cruisers, 1st Class	..	..	..	..	..	..	2	..	..	..	..	..
Cruisers, 2nd Class	..	..	..	..	..	..	..	..	..	..	..	..
Cruisers, 3rd Class	1	..	..	..	..	..	..	..	..	..	..	..
Torpedo Depôt Ships	1	..	..	..	..	..	..	..	..	..	..	..
Total	2	..	..	..	..	..	2	..	..	..	..	..
UNPROTECTED:												
Torpedo Gun Boats, 1st Class	..	..	..	..	..	..	..	..	..	..	..	..
Total	..	..	..	..	..	..	..	..	..	..	..	..
Total Old Programme	3	..	..	..	..	..	2	..	..	..	..	..
NEW PROGRAMME (Naval Defence Act, 1889):												
ARMOURED:												
Battle Ships, 1st Class	..	1	..	..	..	..	..	1	..	..	..	..
Battle Ships, 2nd Class	..	1	..	..	..	..	..	1	..	..	..	..
Cruisers, 1st Class	..	..	..	..	..	..	..	..	..	..	..	..
Total	..	2	..	..	..	..	..	2	..	..	..	..
PROTECTED:												
Cruisers, 1st Class	..	2	..	..	1	..	..	1	..	..	..	..
Cruisers, 2nd Class	5	*1	1	6	3	1	7	..	1	..	1	1
Cruisers, 3rd Class	1	..	..	2	..	..	..	..	..	..	..	..
Total	6	3	1	8	4	1	7	1	1	..	1	1
UNPROTECTED:												
Torpedo Gun Boats, 1st Class	..	..	..	1	..	1	..	..	..	2	3	..
Total	..	..	..	1	..	1	..	..	..	2	3	..
Total New Programme (Naval Defence Act, 1889)	6	5	1	9	4	2	7	3	1	2	4	1
GRAND TOTAL, Ships Building and Completing	9	5	1	9	4	2	9	3	1	2	4	1

* Vessel to be advanced after delivery by Contractors.

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HER MAJESTY'S DOCKYARDS, and by CONTRACT during the YEAR 1891–92.

PEMBROKE.			TOTAL IN DOCKYARDS.			BY CONTRACT.			TOTAL IN DOCKYARDS AND BY CONTRACT.			
To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	To Complete.	To Advance.	To Commence.	GRAND TOTAL.
..	..	..	1	..	..	..	..	..	1	..	..	1
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	1	..	..	..	..	..	1	..	..	1
..	..	..	2	..	..	..	..	..	2	..	..	2
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	1	..	..	..	..	..	1	..	..	1
..	..	..	1	..	..	..	..	..	1	..	..	1
..	..	..	4	..	..	..	..	..	4	..	..	4
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	5	..	..	..	..	..	5	..	..	5 **Total Old Programme.**
..	2	..	..	4	..	..	4	..	..	8	..	8
..	..	..	..	2	..	..	..	..	..	2	..	2
..	..	..	..	..	..	..	..	..	..	..	..	..
..	2	..	..	6	..	..	4	..	..	10	..	10
..	..	..	..	4	..	..	5	..	..	9	..	9
..	1	1	†18	6	5	..	..	..	18	6	5	29
1	..	..	4	..	..	..	..	..	4	..	..	4
1	1	1	22	10	5	..	5	..	22	15	5	42
..	..	..	3	3	1	..	..	6	3	3	7	13
..	..	..	3	3	1	..	..	6	3	3	7	13
1	3	1	25	19	6	..	9	6	25	28	12	65 **Total New Programme (Naval Defence Act, 1889).**
1	**3**	**1**	**30**	**19**	**6**	..	**9**	**6**	**30**	**28**	**12**	**70 GRAND TOTAL.**

† Includes Vessels, 16 in number, completing after delivery by Contractors, viz.: Portsmouth, 5; Devonport, 6; Chatham, 5.

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VI.

LIST of NEW SHIPS and VESSELS Estimated to be passed into the FIRST RESERVE during the Years 1891–92 and 1890–91.

1891–92.					1890–91.				
NAME OF SHIP.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.	NAME OF SHIP.		Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.
ARMOURED SHIPS:					**ARMOURED SHIPS:**				
Nile	Battle Ship, First Class.	11,940	12,000	10	Sans Pareil.	Battle Ships, First Class.	10,470	12,000	15
PROTECTED SHIPS:					**PROTECTED SHIPS:**				
Blake	Cruisers, First Class.	9,000	20,000	12	Barham.	Cruisers, Third Class.	1,830	6,000	6
Blenheim		9,000	20,000	12	Barracouta.		1,580	3,000	6
Vulcan	Torpedo Depôt Ship.	6,620	12,000	8	Barrosa.		1,580	3,000	6
Andromache	Cruisers, Second Class.	3,400	9,000	8	Blanche.		1,580	3,000	6
Apollo		3,400	9,000	8	Blonde.		1,580	3,000	6
Indefatigable		3,600	9,000	8	**UNPROTECTED SHIPS:**				
Intrepid		3,600	9,000	8	Lapwing.	Gunboats, First Class.	805	1,200	6
Latona		3,400	9,000	8	Ringdove.		805	1,200	6
Melampus		3,400	9,000	8	Sparrow.		805	1,200	6
Naiad		3,400	9,000	8	Widgeon.		805	1,200	6
Pique		3,600	9,000	8	Gossamer.	Torpedo Gunboats, First Class.	735	4,500	2
Rainbow.		3,600	9,000	8	Salamander		735	4,500	2
Retribution		3,600	9,000	8	Seagull.		735	4,500	2
Sappho		3,400	9,000	8	Sheldrake.		735	4,500	2
Scylla		3,400	9,000	8	Skipjack.		735	4,500	2
Sybille		3,400	9,000	8	Speedwell.		735	4,500	2
Spartan		3,600	9,000	8					
Sirius		3,600	9,000	8					
Terpsichore		3,400	9,000	8					
Thetis		3,400	9,000	8					
Tribune		3,400	9,000	8					
Bellona	Cruisers, Third Class.	1,830	6,000	6					
Pallas		2,575	7,500	8					
Pearl.		2,575	7,500	8					
Phœbe		2,575	7,500	8					
Philomel.		2,575	7,500	8					
UNPROTECTED SHIPS:									
Antelope	Torpedo Gunboats, First Class.	810	3,500	2					
Circe		810	3,500	2					
Gleaner		735	4,500	2					

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VII.

A List of the British Armoured and Unarmoured Fighting Ships laid down to Build since January, 1885.

Rate.	Name.	When Laid Down.
1885.		
Torpedo Cruiser .	Scout . .	8 Jan.
Armed Despatch Vessel (Steel) .	Alacrity .	14 Feb.
„ „	Surprise .	14 Feb.
Torpedo Cruiser .	Fearless .	22 Sept.
Composite Gun Vessel . .	Icarus . .	18 Aug.
„ „	Swallow .	1 Jan.
Steel Gun Vessel .	Curlew .	5 Jan.
„ „	Landrail .	5 Jan.
Armoured Turret Ship . . .	Victoria, was Renown	23 April
„ „	Sans Pareil .	21 April
Torpedo Cruiser .	Archer .	2 March
„ „ .	Brisk . .	2 March
„ „ .	Cossack .	2 March
„ „ .	Mohawk .	2 March
„ „ .	Porpoise .	2 March
„ „ .	Serpent .	9 Nov.
„ „ .	Tartar . .	2 March
Armoured Cruiser .	Australia .	21 April
„ „ .	Galatea .	21 April
„ „ .	Narcissus .	27 April
„ „ .	Orlando .	23 April
„ „ .	Undaunted .	23 April
Composite Gunboat	Bramble .	25 Aug.
„ „	Lizard . .	25 Aug.
„ „	Rattler .	17 Aug.
„ „	Wasp . .	17 Aug.
Torpedo Gunboat (Steel) . .	Rattlesnake .	— Nov.
1886.		
Torpedo Cruiser .	Racoon .	1 Feb.
Armoured Cruiser .	Immortalité .	18 Jan.
„ „ .	Aurora .	1 Feb.
Ironclad Turret Ship	Trafalgar .	18 Jan.
„ „	Nile . .	8 April
Torpedo Gunboat .	Sandfly .	19 April
„ „ .	Sharpshooter	— Sept.
„ „ .	Grasshopper.	27 April
„ „ .	Spider . .	7 June
Composite Sloop .	Buzzard .	1 May
1887.		
2nd Class Cruiser .	Medea .	April
„ „ .	Medusa .	April
„ „ .	Magicienne .	April
„ „ .	Marathon .	Aug.
„ „ .	Melpomene .	Oct.
Sloop . . .	Daphne .	June
„ . . .	Nymphe .	July
Composite Gunboat	Peacock .	May
„ „ .	Pigeon .	May
„ „ .	Plover . .	May
„ „ .	Pheasant .	June
„ „ .	Partridge .	June
„ „ .	Pigmy . .	Sept.
„ „ .	Magpie .	Dec.
1888.		
1st Class Cruiser, Protected . .	Blake . .	July
„ „	Blenheim .	Oct.

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A List of the British Armoured and Unarmoured Fighting Ships laid down to Build since January, 1885—*continued.*

Rate.	Name.	When Laid Down.
1888—*continued.*		
Torpedo Depôt Ship Protected	Vulcan	June
3rd Class Cruiser, Protected	Barham	Oct.
,, ,,	Barracouta	May
,, ,,	Blanche	May
,, ,,	Blonde	May
,, ,,	Bellona	Aug.
Sloop, Unprotected	Beagle	May
,, ,,	Basilisk	May
Torpedo Gunboat	Salamander	April
,, ,,	Seagull	April
,, ,,	Sheldrake	July
,, ,,	Skipjack	July
,, ,,	Spanker	April
,, ,,	Speedwell	April
1st Class Gunboat (Composite)	Sparrow	—
,, ,,	Thrush	—
,, ,,	Redbreast	Jan.
,, ,,	Redpole	Jan.
,, ,,	Lapwing	May
,, ,,	Ringdove	June
,, ,,	Goldfinch	Aug.
,, ,,	Widgeon	May
1889.		
1st Class Armoured Battle Ship, Turret	Hood	Aug. 12
1st Class Armoured Battle Ship, Barbette	Ramillies	—
,, ,,	Renown	July 9
,, ,,	Repulse	May 4
1889—*continued.*		
1st Class Armoured Battle Ship, Barbette	Resolution	—
,, ,,	Revenge	—
,, ,,	Royal Oak	—
,, ,,	Royal Sovereign	30 Sept.
1st Class Cruiser, Protected	Edgar	3 June
,, ,,	Endymion	—
,, ,,	Gibraltar	—
,, ,,	Grafton	—
,, ,,	Hawke	17 June
,, ,,	Royal Arthur	23 Aug.
,, ,,	St. George	—
,, ,,	Theseus	—
2nd Class Cruiser, Protected	Æolus	—
,, ,,	Andromache	April
,, ,,	Apollo	April
,, ,,	Indefatigable	—
,, ,,	Intrepid	—
,, ,,	Iphigenia	—
,, ,,	Latona	—
,, ,,	Melampus	—
,, ,,	Naiad	—
,, ,,	Pallas	1 July
,, ,,	Pearl	1 April
,, ,,	Phœbe	23 April
,, ,,	Philomel	9 May
,, ,,	Pique	—
,, ,,	Rainbow	—
,, ,,	Retribution	—
,, ,,	Ringarooma, was Psyche	—
,, ,,	Sappho	—
,, ,,	Scylla	—

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A List of the British Armoured and Unarmoured Fighting Ships laid down to Build since January, 1885—*continued.*

Rate.	Name.	When Laid Down.
1889—*continued.*		
2nd Class Cruiser, Protected	Sirius	—
" "	Spartan	—
" "	Sybille	—
" "	Tauranga, was Phœnix	—
" "	Terpsichore	—
" "	Thetis	—
" "	Tribune	—
3rd Class Cruiser, Protected	Katoomba, was Pandora	—
" "	Mildura, was Pelorus	—
" "	Wallaroo, was Persian	—
1st Class Torpedo Gunboat (Steel)	Antelope	21 Oct.
" "	Boomerang, was Whiting	—
" "	Gleaner	21 Jan.
" "	Gossamer	21 Jan.
" "	Karrakatta, was Wizard	—
1890.		
2nd Class Armoured Battle Ship, Barbette	Barfleur	—
" "	Centurion	—
1st Class Cruiser, Protected	Crescent	—
2nd Class Cruiser, Protected	Astræa	—
" "	Bonaventure	—
" "	Brilliant	—
1st Class Torpedo Gunboat (Steel)	Alarm	—
" "	Circe	—
" "	Hebe	—

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VIII.—STATEMENT showing the COST of the different CLASSES of in each Year to the FLEET, and the

YEAR OF COMPLETION. For Details of Cost, &c., *see* Statement IX.	Armoured, Protected, and Partially Protected. Depreciation, 4 per cent. per annum for 22 years from date of Completion.	Corvettes, Sloops, Torpedo Cruisers, Gun Vessels, Gunboats, Troop Ships, &c. Depreciation, 6 per cent. per annum for 15 years from date of Completion.
	£	£
First Cost of Ships not included for Depreciation in following Tables	5,918,634	4,976,281
First Cost of Ships completed in 1869–70 . .	478,971	..
„ „ 1870–71 . .	782,386	..
„ „ 1871–72 . .	939,092	..
„ „ 1872–73 . .	273,169	..
„ „ 1873–74 . .	847,405	..
„ „ 1874–75 . .	300,767	..
„ „ 1875–76 . .	..	..
„ „ 1876–77 . .	802,030	411,785
„ „ 1877–78 . .	1,699,854	952,505
„ „ 1878–79 . .	1,134,012	1,217,857
„ „ 1879–80 . .	809,139	674,575
„ „ 1880–81 . .	684,102	363,215
„ „ 1881–82 . .	2,370,225	284,220
„ „ 1882–83 . .	755,247	175,555
„ „ 1883–84 . .	251,322	461,852
„ „ 1884–85 . .	725,919	374,122
„ „ 1885–86 . .	2,884,409	..
„ „ 1886–87 . .	2,747,065	624,549
„ „ 1887–88 . .	6,208,645	1,204,760
„ „ 1888–89 . .	1,887,221	627,757
„ „ 1889–90 . .	2,355,273	880,178
„ „ 1890–91 (*a*) .	2,971,330	227,326
TOTAL	31,907,583	8,480,256
Add,—Cost of Vessels lost, sold, or broken up, built within above period	952,649	456,537
TOTAL	32,860,232	8,936,793
Estimated Annual Percentage for Depreciation	4 per cent.	6 per cent.
Annual Amount required for Replacement . .	£1,314,409	£536,208

(*a*) Revised estimated cost.

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VESSELS (including Proportion of INCIDENTAL CHARGES) added Estimated Annual RATE of DEPRECIATION.

Torpedo Boats, Steam Launches, &c. Depreciation, 9 per cent. per annum for 11 years from date of Completion.	Guard, Receiving, Training, and Harbour Vessels. Depreciation, 4 per cent. per annum for 22 years from date of Completion.	Small Vessels, Tugs, and Yard Craft. Depreciation, 5 per cent. per annum for 18 years from date of Completion.	TOTAL.
£	£	£	£
190,600 (Estimated.)	4,697,146	295,347	16,078,008
..	..	..	478,971
..	97,844	..	880,230
..	33,371	..	972,463
..	22,722	..	295,891
..	..	40,547	887,952
..	..	8,338	309,105
..	..	60,862	60,862
..	..	..	1,213,815
..	..	26,567	2,678,926
..	68,179	..	2,420,048
..	54,036	..	1,537,750
1,670,000 (Estimated.)	..	4,368	30,934,049
	..	9,830	
	..	23,920	
	..	71,512	
	..	..	
	..	7,280	
	..	12,869	
	..	9,204	
	..	21,129	
	24,007	..	
	..	15,638	
1,670,000	300,159	312,064	42,670,062
24,000 (Estimated.)	..	60,328	1,493,514
1,694,000	300,159	372,392	44,163,576
9 per cent.	4 per cent.	5 per cent.	..
£152,460	£12,006	£18,620	£2,033,703

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IX.—Statement showing the Approximate Aggregate Cost of the of the Royal Navy, under the years of their

For Details See Statement. No.	CLASS OF SHIP.	Prior to 1869-70.	1869-70.	1870-1.	1871-2.	1872-3.	1873-4.	1874-5.	1875-6.	1876-7.	1877-8.	1878-9.	1879-80.	1880-1.
	1. EFFECTIVE SHIPS:													
	COMBATANT:	£	£	£	£	£	£	£	£	£	£	£	£	£
3	Armoured . .	3,098,802	371,415	714,257	399,096	267,718	771,253	239,197	..	682,626	1,461,069	886,918	414,434	531,846
		411,053	*107,556*	*68,129*	*54,841*	*5,451*	*76,152*	*61,570*		*119,404*	*238,785*	*119,024*	*13,374*	*24,816*
3	Protected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
3	Partially protected	..	..	..	..	..	..	..	..	..	..	123,913	368,177	122,681
												4,157	*13,154*	*4,759*
	Unprotected, viz.:													
3	Frigates . . .	..	226,260	..	..	..	..	210,234	..	..	..	..	..	..
			57,580					*59,582*						
3	Corvettes . . .	..	132,817	132,102	..	..	..	..	..	103,429	444,079	209,712	224,052	..
			2,578	*2,852*						*3,886*	*48,422*	*43,831*	*32,961*	
3	Sloops . . .	..	..	..	..	..	..	..	..	..	172,102	57,290	..	..
											18,207	*14,582*		
3	Torpedo Depot Ship, and Cruisers .	..	..	..	..	..	..	..	..	..	..	126,517	..	..
												5,060		
3	Torpedo Gunboats	..	..	..	..	..	..	..	..	..	..	..	..	..
3	Gun-Vessels . .	..	..	..	..	..	26,709	..	..	..	77,671	..	..	75,247
							4,736				*10,125*			*2,715*
3	Gunboats . . .	..	..	..	..	15,912	..	..	..	..	46,701	48,961	..	23,653
						3,898					*1,530*	*1,721*		*4,350*
3	Gunboats, Coast Defence . . .	6,719	..	7,751	88,539	54,059	43,855	..	..	..	40,714	217,838	47,500	..
		33		*2,388*	*15,111*	*5,489*	*266*				*3,192*	*17,686*	*9,072*	
3	Despatch, Surveying Vessels, &c.	200,626	..	..	..	..	..	171,434	..	..	..	..	..	102,436
		51,999						*40,619*						*3,666*
..	Torpedo Boats, Launches, &c. .	..	..	..	..	..	..	..	..	..	..	..	..	..
	£	3,306,147	730,492	854,110	487,635	337,689	841,817	620,865	..	786,055	2,242,336	1,671,149	1,054,163	855,863
		463,085	*167,714*	*73,369*	*69,952*	*14,838*	*81,154*	*161,771*		*123,290*	*320,261*	*206,061*	*68,561*	*40,306*
	NON-COMBATANT:													
3	Troop and Store Ships . . .	382,114	..	..	..	..	21,500	..	101,625	..	..	123,078	..	..
		9,558							*2,507*			*2,157*		
..	Small Steam Vessels, Tugs, Tanks, &c. . .	235,333	22,054	..	..	..	37,798	8,018	50,521	..	25,546	..	..	4,200
		20,128	*882*				*2,749*	*320*	*10,341*		*1,021*			*168*
	2. NON-EFFECTIVE SHIPS:													
..	Ships capable of being fitted, but not ordered . .	1,354,216	..	..	374,777	..	..	..	367,756	249,974	..	288,256	302,052	134,421
		93,547			*110,378*				*23,603*	*54,496*		*61,168*	*58,938*	*16,727*
..	Ships unfit for Service, or ordered to be sold, &c. .	2,871,411	..	..	..	15,743	15,888	..	22,991	..	86,760	..	..	..
		734,067				*3,859*	*3,550*		*919*		*3,002*			
	3. GUARD, RECEIVING, &c., SHIPS:													
..	Guard, Receiving, &c., Ships . .	3,319,345	..	75,993	25,843	16,230	..	..	..	..	..	53,884	38,598	..
		1,190,809		*21,851*	*7,528*	*6,492*						*14,295*	*15,438*	
	4. SHIPS NOT COMPLETE:													
..	Armoured . .	..	..	..	..	..	..	..	..	..	..	..	..	..
..	Protected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
..	Unprotected . .	..	..	..	..	..	..	..	..	..	..	..	..	..
	TOTAL . £	11,468,566	752,546	930,103	888,255	369,662	917,003	628,883	542,893	1,036,029	2,354,642	2,136,367	1,394,813	994,484
		2,511,194	*168,596*	*95,220*	*187,858*	*25,189*	*87,453*	*162,091*	*37,370*	*177,786*	*324,284*	*283,681*	*142,937*	*57,201*

NOTE.—The Figures in *Italics* represent the dockyard incidental charges apportioned to each Ship.

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Effective and Non-Effective SHIPS at present on the Strength completion. (Incidental Charges printed in *Italics*).

1881-2.	1882-3.	1883-4.	1884-5.	1885-6.	1886-7.	1887-8.	1888-9.	1889-90.	1890-91.*	TOTAL First Cost.	Expended to 31st of March, 1889, on Vessels not yet Complete.	Outstanding Liabilities on 1st of April, 1889, on Ships Commenced.
£	£	£	£	£	£	£	£	£	£	£	£	£
1,912,964	296,761	..	530,015	1,210,109	2,227,883	4,991,160	1,191,532	1,513,134	1,541,318		..	..
179,368	*4,696*		*104,527*	*206,566*	*319,274*	*471,447*	*136,631*	*92,629*	*72,341*			
..	226,305	..	..	..	..	638,271	496,193	688,979	1,283,856	31,141,993	..	..
	49,476					*107,767*	*62,865*	*60,631*	*73,815*	*3,549,076*		
123,044	68,056	204,775	73,644	1,279,454	191,138	..	..	..	..		..	..
5,034	*18,554*	*46,547*	*17,733*	*188,280*	*8,770*							
..	..	..	..	..	..	..	..	..	..	436,494	..	..
										117,162		
..	..	234,860	..	..	..	..	..	..	..		..	..
		34,446										
105,363	..	53,871	264,010	..	180,246	64,409	170,227	112,656	..		..	..
27,036		*13,824*	*41,658*		*30,205*	*16,069*	*32,186*	*16,134*				
..	..	..	..	..	96,462	690,206	..	..	..		..	..
					4,781	*48,474*						
..	..	..	..	..	..	146,074	51,321	314,302	163,304		..	..
						22,770	*7,011*	*35,604*	*22,775*	7,123,954		
..	..	..	..	..	114,033	..	..	..	..	*856,823*	..	..
					25,365							
45,214	23,209	32,783	65,584	..	..	141,815	240,413	356,543	99,797		..	..
1,941	*967*	*1,262*	*2,870*			*3,798*	*42,152*	*45,039*	*1,450*			
23,478	..	..	..	..	..	..	..	..	..		..	..
4,524												
23,570	71,766	88,037	..	..	167,178	67,478	77,320	..	..		..	..
733	*3,232*	*2,769*			*6,279*	*3,667*	*7,147*					
..	..	..	..	..	..	..	..	..	..	†1,860,600	..	..
2,233,633	686,097	614,326	933,253	2,489,563	2,976,940	6,739,413	2,227,006	2,985,614	3,028,275	38,702,441	..	..
218,436	*76,925*	*98,848*	*166,788*	*394,846*	*394,674*	*673,992*	*287,972*	*249,837*	*170,381*	*4,523,061*		
										†1,860,600		
..	..	..	..	..	..	..	..	..	..	628,317	..	..
										14,222		
9,452	23,000	68,763	..	7,000	12,727	8,187	20,650	..	13,898	547,147	..	..
378	*920*	*2,749*		*280*	*142*	*1,017*	*479*		*1,740*	*43,314*		
123,015	141,949	..	..	..	..	..	..	..	..		..	..
26,800	*25,831*									6,395,974		
46,765	..	..	..	..	..	..	..	..	..	*1,222,681*	..	..
5,796												
..	..	..	..	..	..	..	..	21,023	..	3,550,916	..	..
								2,984		*1,259,397*		
..	..	..	..	..	..	..	..	..	..	..	2,332,617	5,369,652
											105,687	*255,953*
..	..	..	..	..	..	..	..	..	..	..	4,845,824	3,704,644
											193,406	*218,038*
..	..	..	..	..	..	..	..	..	..	..	49,924	165,605
											8,931	*18,301*
											‡	◊
2,412,865	851,046	683,089	933,253	2,496,563	2,989,667	6,747,600	2,247,656	3,006,637	3,042,173	49,824,795	7,228,365	‖9,239,901
251,410	*103,676*	*101,597*	*166,788*	*395,126*	*394,816*	*675,009*	*288,451*	*252,821*	*172,121*	*7,062,675*	*307,424*	*‖492,292*
										†1,860,600		

* The figures for this year represent the revised estimated cost of the vessels to be completed.
† It is estimated that of this sum about £450,000 relates to vessels completed prior to 1885-86.
‡ Includes expenditure, &c., upon ships building by contract under the "Naval Defence Act."
◊ Includes outstanding liabilities upon ships building by contract under the "Naval Defence Act."
‖ These amounts are exclusive of the outstanding liabilities for Machinery, &c., on the 1st April, 1891, upon ships where details of Estimates are not yet completed.

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Comparative Tables of British, French, and Russian Ships, as given in the 'Naval Annual' for 1888-89, and 1890, brought up to present date.

TABLE I.—FIRST-CLASS BATTLE SHIPS.

ENGLAND.			FRANCE.			RUSSIA.		
Date.	Name.	Displacement.	Date.	Name.	Displacement.	Date.	Name.	Displacement.
		Tons.			Tons.			Tons.
1883	Agamemnon	8,660	1883	Amiral Baudin	11,380	1886	Catherine II.	10,150
1883	Ajax	8,660	1879	Amiral Duperré	11,100	Bldg.	Dvenadsat Apostoloff ..	8,076
1877	Alexandra	9,490	Bldg.	Brennus	10,826	Bldg.	Gheorghy Pobyedonosets	10,280
1889	Anson	10,600	Bldg.	Charles Martel	11,882	1872	Peter the Great	8,749
Bldg.	Barfleur	10,500	1881	Courbet	9,700	1887	Sinope	10,181
1888	Benbow	10,600	1879	Dévastation	10,100	1886	Tchesmé	10,181
1889	Camperdown	10,600	1885	Formidable	11,441			
Bldg.	Centurion	10,500	1886	Hoche	10,650			
1886	Collingwood	9,500	Bldg.	Jauréguibery	12,000			
1886	Colossus	9,420	Bldg.	Lazare Carnot	12,000			
1873	Devastation	9,330	1890	Magenta	10,581			
1875	Dreadnought	10,820	1887	Marceau	10,581			
1886	Edinburgh	9,420	1887	Neptune	10,581			
Bldg.	Hood	14,150	1876	Redoutable	8,860			

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1887	Howe	10,300						
1881	Inflexible	11,880						
1878	Neptune	9,380						
1890	Nile	11,940						
Bldg.	Ramillies	14,150						
Bldg.	Renown	14,150						
Bldg.	Repulse	14,150						
Bldg.	Resolution	14,150						
Bldg.	Revenge	14,150						
1887	Rodney	10,300						
Bldg.	Royal Oak	14,150						
Bldg. Ld. 1891	Royal Sovereign	14,150						
1889	Sanspareil	10,470						
1880	Superb	9,170						
1877	Téméraire	8,540						
1877	Thunderer	9,330						
1887	Trafalgar	11,940						
1889	Victoria	10,470						
	Total 32 Ships	354,950		Total 14 Ships	151,682		Total 6 Ships	57,617

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TABLE II.—SECOND-CLASS BATTLE SHIPS

ENGLAND.			FRANCE.			RUSSIA.		
Date.	Name.	Displacement.	Date.	Name.	Displacement.	Date.	Name.	Displacement.
		Tons.			Tons.			Tons.
1870	Audacious	6,010	1885	Caiman	7,230	1873	General Admiral ..	4,604
1866	Bellerophon	7,550	1875	*Colbert	8,457	1875	Gerzog Edinburgski ..	4,604
1882	Conqueror	6,200	1873	Friedland	8,540	1878	Minin	6,168
1864	Hector	6,710	1863	Héroine	5,587	1882	Vladimir Monomach ..	5,796
1868	Hercules	8,680	1883	Indomptable	7,168			
1887	Hero	6,200	1869	*Marengo	7,900			
1870	Invincible	6,010	1868	*Océan	7,500			
1871	Iron Duke	6,010	1885	Requin	7,200			
1869	Monarch	8,320	1865	*Revanche	5,819			
1868	Penelope	4,470	1873	*Richelieu	9,100			
1871	Sultan	9,290	1870	*Suffren	7,600			
1872	Swiftsure	6,910	1881	Terrible	7,200			
1873	Triumph	6,640	1876	*Trident	8,800			
	Total 13 Ships	89,000		Total 13 Ships	98,101		Total 4 Ships ..	21,172

* These ships are built of wood.

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TABLE III.—LOOK-OUT SHIPS.

ENGLAND.			FRANCE.		
Speed.	Name.	Displacement.	Speed.	Name	Displacement.
Knots.		Tons.	Knots.		Tons.
17	Alacrity	1,700	17¾	Condor	1,280
17	Archer	1,700	17	Epervier	1,280
19½	Barham	1,830	17½	Faucon	1,280
16½	Barracouta	1,500	18	Fleurus	1,310
16½	Barrosa	1,580	17½	Vautour	1,280
19½	Bellona	1,830	18	Wattignies	1,310
16½	Blanche	1,580			
16½	Blonde	1,580			
17	Brisk	1,770			
17	Cossack	1,770			
17	Fearless	1,580			
18	Iris	3,730			
18	Mercury	3,730			
17	Mohawk	1,770			
17	Porpoise	1,770			
17	Racoon	1,770			
17	Scout	1,580			
17	Surprise	1,700			
17	Tartar	1,770			
	Total 19 Ships	36,390		Total 6 Ships	7,740

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TABLE IV.—TORPEDO GUN VESSELS.

ENGLAND.			FRANCE.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.
Knots.		Tons.	Knots.		Tons.
21	Antelope	735	18	Bombe	320
21	Boomerang	735	18½	Catinat	450
21	Circe	735	18	Couleuvrine	320
21	Gleaner	735	18	Dague	320
21	Gossamer	735	18	Dragonne	320
19	Grasshopper	525	18	Flèche	320
21	Hebe	735	18½	Iberville	450
21	Karrakatta	735	18	Lance	320
21	Leda	735	18½	Levoisier	450
18	Polyphemus	2,640	18½	Leger	450
19	Rattlesnake	550	18½	Lévrier	450
21	Salamander	735	18	Sainte-Barbe	320
19	Sandfly	525	18	Salve	320
21	Seagull	735		Not named	850
21	Sharpshooter	785		Not named	850
21	Sheldrake	735			
21	Skipjack	735			
21	Spanker	735			
21	Speedwell	735			
19	Spider	525			
	Total 20 Vessels	15,790		Total 15 Vessels	6,510

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Table V.—Coast Defence Ships.

ENGLAND.			FRANCE.			RUSSIA.		
Date.	Name.	Displacement.	Date.	Name.	Displacement.	Date.	Name.	Displacement.
		Tons.			Tons.			Tons.
1876	Belleisle	4,870	1885	Achéron	1,640	1868	Admiral Chicagoff ..	3,511
1871	Cyclops	3,560	1870	*Bélier	3,600	1868	Admiral Greig	3,593
1871	Glatton	4,910	1872	*Bouledogue	3,400	1867	Admiral Lazareff ..	3,556
1871	Gorgon	3,560	Building	Bouvines	6,590	1868	Admiral Spiradoff ..	3,740
1871	Hecate	3,560	1887	Cocyte	1,640	1864	Bronenosets	1,482
1870	Hotspur	4,010	1885	Flamme	1,045	1867	Charodeika	2,026
1871	Hydra	3,560	1877	Fulminant	5,574	1864	Edinorog	1,407
1879	Orion	4,870	1883	Furieux	5,700	Building	Grozyashtchy	1,492
1864	Prince Albert ..	3,880	1884	Fusée	1,045	1867	Kniaz Pojarski	5,007
1872	Rupert	5,440	1888	Grenade	1,045	1864	Koldun	1,666
1863	Scorpion	2,750	Building	Jemmapes	6,590	1865	Kreml	3,664
1863	Wivern	2,750	1886	Mitraille	1,045	1864	Latnik	1,515
			1863	Onondaga	2,600	1864	Lava	1,591
			Building	Phlégéton	1,640	1864	Netron-Menya	3,494
			,,	Styx	1,640	1873	Novgorod	2,706
			1862	*Taureau	2,700	1864	Perun	1,549
			1876	Tempête	4,523	1863	Pervenetz	3,279
			1871	*Tigre	3,600	1867	Rusalka	2,026
			1880	Tonnant	4,707	1864	Smertch	1,520
			1875	Tonnerre	5,700	1864	Strelitz	1,431
			Building	Tréhouart	6,590	1864	Tifun	1,666
			,,	Valmy	6,590	1864	Uragan	1,415
			1878	Vengeur	4,523	1875	Vice-Admiral Popoff	3,590
						1864	Veshtchun	1,448
	Total 12 Ships	47,720		Total 23 Ships	83,727		Total 24 Ships ..	58,374

* Built of wood.

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TABLE VI.—ARMOURED CRUISERS.

ENGLAND.			FRANCE.			RUSSIA.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.
Knots.		Tons.	Knots.		Tons.	Knots.		Tons.
18½	Aurora	5,600	19	Bruix	4,745	16½	Admiral Nachimoff ..	7,782
18½	Australia	5,600	19	Chanzy	4,745	15½	Alexander II	8,440
18½	Galatea	5,600	19	Charner	4,745	15½	Dimitri Donskoi	5,893
18½	Immortalité	5,600	20	Dupuy de Lôme	6,297	14½	Gangoot	6,592
16¾	Impérieuse	8,400	19	Latouche Tréville	4,745	16	Navarin	9,476
18½	Narcissus	5,600	14	Bayard	6,000	15	Nicolai I, ...	8,440
14½	Nelson	7,630	14	Dugueselin	5,869	18	Pamyat Azova	6,000
13½	Northampton	7,630	13	*La Galissonière	4,700	18	Rurik	10,600
18½	Orlando	5,600	13	*Triomphante	4,700			
12½	Shannon	5,390	14	*Turenne	6,400			
18½	Undaunted	5,600	14	Vauban	5,900			
16¾	Warspite	8,400	12¾	*Victorieuse	4,600			
14½	Achilles	9,820						
14½	Agincourt	10,690						
14	Black Prince	9,210						
14½	Minotaur	10,690						
14½	Northumberland	10,780						
14½	Warrior	9,210						
	Total 18 Ships	137,050		Total 12 Ships	63,446		Total 8 Ships	63,223

* Built of wood.

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TABLE VII.—PROTECTED CRUISERS, FIRST CLASS.

ENGLAND.			FRANCE.			RUSSIA.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.
Knots.		Tons.	Knots.		Tons.	Knots.		Tons.
22	Blake	9,000	19	Alger	4,160	19	Admiral Korniloff	5,000
22	Blenheim	9,000	19	Cecille	5,766			
19½	Crescent	7,700	19	Isly	4,160			
19¾	Edgar	7,350	19	Jean Bart	4,160			
19¾	Endymion	7,350	17	Sfax	4,488			
19½	Gibraltar	7,700	19	Tage	7,045			
19¾	Grafton	7,350						
19¾	Hawke	7,350						
19½	Royal Arthur	7,700						
19½	St. George	7,700						
19¾	Theseus	7,350						
	Total 11 Ships	85,550		Total 6 Ships	29,779		Total 1 Ship	5,000

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TABLE VIII.—PROTECTED CRUSIERS—SECOND AND THIRD CLASSES.

ENGLAND.			FRANCE.			RUSSIA.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.
Knots.		Tons.	Knots.		Tons.	Knots.		Tons.
19¾	Æolus	3,600	19½	Coetlogon	1,850	15	Rynda	2,950
17	Amphion	4,300	19½	Cosmao	1,850	15	Vitiaz	2,950
20	Andromache	3,400	20	Davout	3,027			
20	Apollo	3,400	19½	Forbin	1,850			
17	Arethusa	4,300	19½	Lalande	1,877			
19½	Astræa	4,360	20	Suchet	3,027			
19½	Bonaventure	4,360	19½	Surcouf	1,850			
19¾	Brilliant	3,600	19½	Troude	1,877			
19½	Cambrian	4,360						
18	Forth	4,050						
19¾	Indefatigable	3,600						
19¾	Intrepid	3,600						
19¾	Iphigenia	3,600						
19	*Katoomba	2,575						
20	Latona	3,400						
17	Leander	4,300						
19¾	Magicienne	2,950						
19¾	Marathon	2,950						
20	Medea	2,800						
20	Medusa	2,800						
20	Melampus	3,400						
19¾	Melpomene	2,950						

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TABLE IX.—COMPARATIVE STATEMENT SHOWING EXPENDITURE ON CONSTRUCTION OF NEW VESSELS, HULLS AND MACHINERY, IN ENGLAND AND FRANCE, FROM 1863–64 TO 1891–92.

Year.	England.	France.	Year.	England.	France.	Year.	England.	France.
	£	£		£	£		£	£
1863–64	1,282,710	920,196	1874–75	1,528,161	921,380	1885–86	3,737,000	1,355,684
1864–65	1,674,574	873,300	1875–76	1,613,218	1,054,560	1886–87	3,495,000	1,280,000
1865–66	1,116,198	931,348	1876–77	2,121,960	1,301,988	1887–88	2,819,537	2,510,020
1866–67	1,014,406	875,468	1877–78	2,922,442	1,501,884	1888–89	2,398,805 *190,708	1,848,930
1867–68	1,800,749	797,104	1878–79	1,508,049	1,504,656	1889–90	3,243,105 384,024 †3,627,729	1,759,684
1868–69	1,694,362	668,780	1879–80	1,388,607	1,375,296			
1869–70	1,387,047	655,016	1880–81	1,426,349	1,345,084	1890–91	‡3,181,736 §3,595,930 6,777,666	2,396,000
1870–71	1,330,814	411,948	1881–82	1,682,500	1,400,152			
1871–72	1,184,172	429,832	1882–83	1,767,014	1,559,644	1891–92	¶3,210,627 ‖3,140,733 6,351,360	2,800,000
1872–73	809,087	614,460	1883–84	1,930,090	1,536,508			
1873–74	1,290,028	789,684	1884–85	2,242,070	1,510,704			

* Expenditure on ships building under the Imperial Defence Act of 1888. † Navy Estimates for 1889–90.
‡ Navy Estimates for 1890–91. § Additional. Provided under the Naval Defence Act.
¶ Sum voted in Navy Estimates for 1891–92. ‖ Additional. Provided under the Naval Defence Act, Section 1 (3) (*a*).

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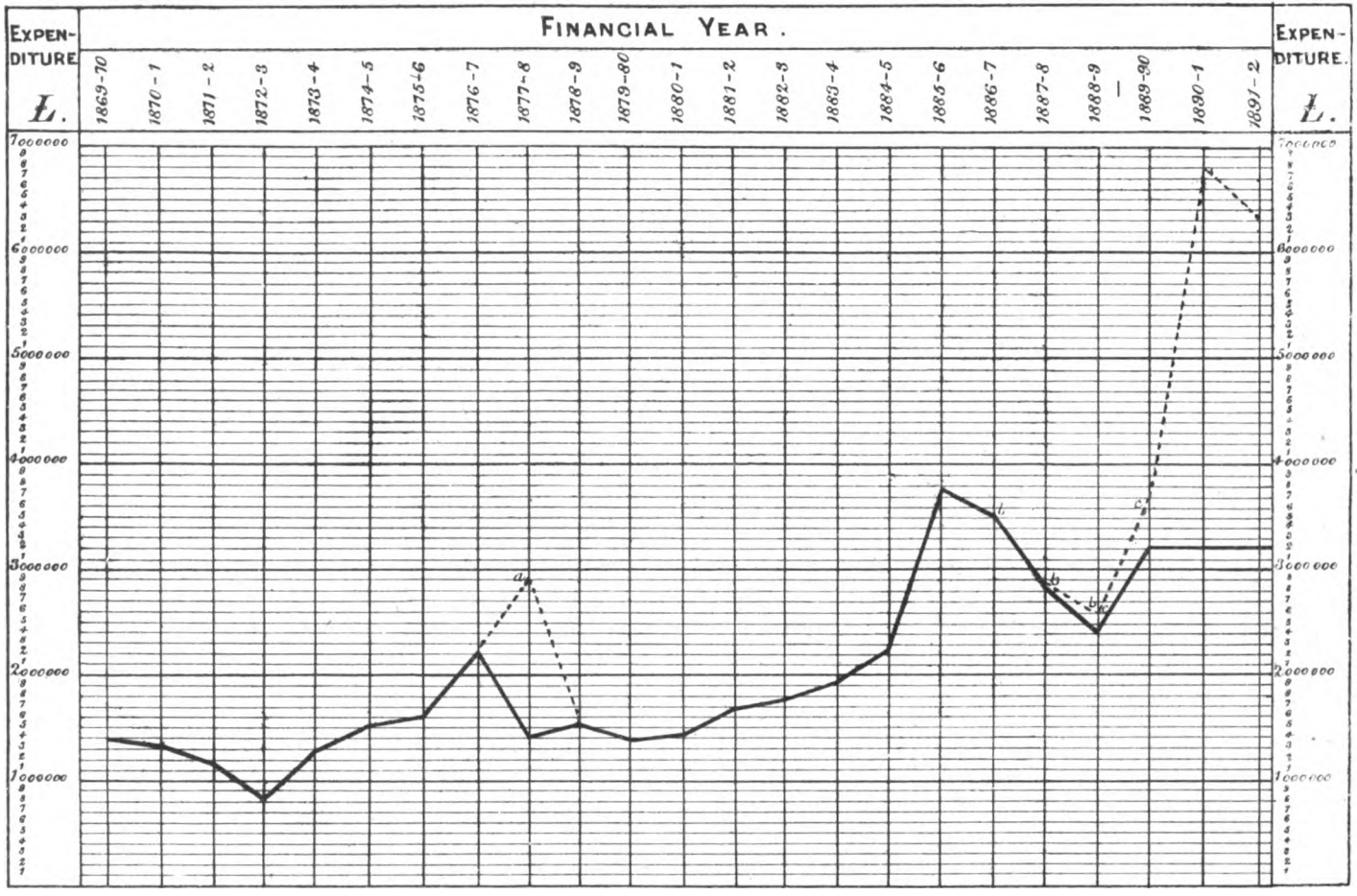
DIAGRAM SHEWING THE EXPENDITURE UPON THE CONSTRUCTION OF NEW SHIPS DURING THE TWENTY YEARS BETWEEN 1869-70 AND 1891-92.



(a) Includes £1523000 for purchase of Ships under the Vote of Credit.
(b) Includes Expenditure under Lord Northbrooks Special Programme.
(c) Includes Estimated Expenditure under the Defence Acts of 1888 and 1889.

1889-90. 1890-91 & 1891-92 are Estimates.

Note. *The distance at any point of the drawn line from the base represents on the scale of £'s the ORDINARY expenditure of the year marked by that point. The distance at any point of the dotted line from the base represents on the scale of £'s both the ORDINARY and the EXTRAORDINARY expenditure of the year marked by that point.*

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XI.

FRENCH NAVAL ESTIMATES, 1892.

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French Navy Estimates for 1892.

Cap.	Heads of Expenditure.	Credits proposed for the year 1892.	Credits allowed for the year 1891.
		£	£
	PERSONNEL.		
1	Admiralty Office	48,008	45,708
2	Navy Pay	1,508,741	1,437,912
3	Marines.	373,459	376,086
4	Gendarmerie Maritime	33,211	33,200
5	Inspection of Administrative and Financial Service	13,383	13,383
6	Construction Staff	81,491	81,490
7	Administrative Staff	310,141	310,141
8	Medical Staff.	83,835	86,304
	LABOUR.		
	Wages —		
9	Shipbuilding; new ships; conversions; fitting for sea	447,828	427,828
10	Shipbuilding; repairs	236,160	236,160
11	Armaments; construction of new guns .	37,960	37,960
12	Armaments; repairs	48,160	48,160
13	Works	43,252	43,286
14	Victualling	30,160	34,160
15	Master-attendants' and Storekeepers' Departments	278,948	278,948
16	Miscellaneous	16,120	16,120
	MATÉRIEL.		
	Stores and Supplies—		
17	Admiralty	9,600	9,600
18	Ships fitting for sea; repairs . .	272,000	252,000
	Carried forward . .	£3,872,457	£3,768,446

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Cap.	Heads of Expenditure.	Credits proposed for the year 1892.	Credits allowed for the year 1891.
		£	£
	Brought forward . .	3,872,457	3,768,446
	MATÉRIEL—*continued.*		
	Stores and Supplies—*continued.*		
19	Shipbuilding; contracts for new ships .	408,000	373,760
	Supplementary for ditto . . .	400,000	340,000
20	Shipbuilding; new ships; conversions; fitting for sea	668,000	684,000
21	Armaments; manufacture of new guns .	320,000	360,000
	Supplementary for ditto . . .	40,000	40,000
22	Armaments; repairs	358,800	318,800
23	Torpedoes	87,840	145,840
24	Works; new and large alterations. .	110,160	110,160
	Ditto Supplementary for Defence of the Military Ports . . .	158,000	142,000
25	Works; repairs	57,600	57,600
26	Clothing	182,246	138,400
27	Victualling.	774,400	774,400
28	Barracks	36,102	36,102
29	Medicines	56,000	56,000
30	Machinery	184,367	184,367
31	Fuel and Lighting	32,000	32,000
32	Office Furniture, Printing and Stationery	41,706	40,553
	MISCELLANEOUS.		
33	Travelling expenses and freight . .	178,000	182,000
34	Allowance for lodgings	176,000	180,000
35	Charitable	49,565	45,950
36	Pensions to Seamen	311,388	309,072
37	Secret Service	2,600	2,600
38	Miscellaneous	10,905	10,500
	Totals . . .	£8,516,136	£8,382,551

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Order for Building.	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit, putting Machinery in place.					Labour in 1891.
					Days' Work Estimated.			State of advancement in hundredths.		
					Total to build.	Number worked 1st Jan., 1892.	Proposed for 1892.	1st January, 1892.	To advance in 1892.	
				£	Number of days.	Number of days.	Number of days.			£
Battle Ships	Neptune	Aug. 1882	Brest	580,000 *	1,350,000	1,310,367	39,633	97	3	5,138
	Brennus	Jan. 1889	Lorient	660,000 *	1,500,000	928,709	380,000	62	25	47,774
	Magenta	Jan. 1883	Toulon	568,800 *	1,400,000	1,223,911	176,089	88	12	26,144
	Charles Martel	..	Brest	880,000 †	1,500,000	94,788	270,000	6	18	35,003
	Lazare Carnot	..	Toulon	838,400 †	1,500,000	93,756	250,000	6	17	37,118
	New Ship	..	Lorient	‡	1,500,000	..	79,000	..	5	9,932
										161,109
Coast Defence Ironclad	Tréhouart	Oct. 1890	Lorient	434,800 †	950,000	309,760	228,000	32	24	28,664
Armoured Gunboats	Phlégéton	Mar. 1885	Cherbourg	108,240 *	310,000	281,050	28,950	91	9	3,962
	Styx	Sept. 1889	Cherbourg	108,240 *	310,000	213,783	96,217	69	31	13,168
										17,130
Armoured Cruisers, 1st class	Dupuy-de-Lôme	July 1888	Brest	301,120 †	830,000	639,042	190,958	77	23	24,756
	Charner	June 1889	Rochefort	255,920 †	650,000	230,479	220,000	35	34	30,778
	Bruix	Oct. 1890	Rochefort	255,920 †	650,000	53,116	161,000	8	..	22,524
										78,058

NOTE.—To comply with requisitions made in Parliament at different times, the Admiralty have adopted a special form of estimate for general use which will take effect from the 10th December, 1890. The Yards have been asked to revise their estimates, using the new form for all ships now building. These forms have not been approved sufficiently long to admit of their use in this year's Programme, except in the cases of the Lazare Carnot and Charles Martel. The new forms will be used when the Programme is revised previous to the votes being approved.

* The cost of the hydraulic mountings for these ships has been charged partly to the hull and partly to armament.

† The cost of the hydraulic gun mountings for these ships is included in cost of hull.

‡ The design of this ship not being approved, only the amount of labour to be expended on it in 1892 is given.

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BUILDING in DOCKYARDS, 1892.

Makers.	Machinery. Cost.	Days' Work. To Complete.	Worked 1st Jan., 1892.	Proposed for 1892.	Advancement in hundredths. 1st January, 1892.	Proposed for 1892.	Labour in 1892.	Cost of Armament. *	Total Cost of Vessel.	Total Expenditure on Labour, 1892. Hulls and Fittings.	Machinery.	Total.
	£	Number of days.	Number of days.	Number of days.			£	£	£	£	£	£
Indret . .	120,000	225,000	225,000	..	100	..	..	144,960	844,984	5,138	..	5,138
Indret Belleville à S. Denis .	132,000†	170,000§	109,140	55,000	64	32	8,470	160,000	952,000	47,774	8,470	56,244
Le Creusot .	125,000	..	..	..	..	..	..	144,984	838,784	26,144	..	26,144
Contract .	111,804	..	..	..	..	..	..	96,200	1,088,004	35,003	..	35,003
Indret . .	128,400‡	213,000	21,000	77,000	9	36	11,858	95,000	1,061,800	37,118	11,858	48,976
Indret . .	..	210,000	..	21,000	..	10	3,234	..	..	9,932	3,234	13,166
							23,562			161,109	23,562	184,671
Indret and Belleville	79,808‡	92,000§	26,350	35,000	29	38	5,390	58,000	572,608	28,664	5,390	34,054
Saint Denis (Claparède)	19,400	..	..	..	..	..	..	24,000	151,640	3,962	..	3,962
Saint Denis (Claparède)	19,400	..	..	..	..	..	..	24,000	151,640	13,168	..	13,168
							..			17,130	..	17,130
Saint Denis (Société de la Loire) .	121,740	..	..	..	..	..	..	46,160	469,020	24,756	..	24,756
S. Mediter . (Havre) .	74,936	..	..	..	..	..	..	37,860	368,716	30,778	..	30,778
Contract .	74,936‖	..	..	..	..	..	..	37,860	368,716	22,524	..	22,524
							..			78,058	..	78,058

* The cost of the guns and mountings only is included in the sums in this column. A recent order has directed that the cost of gun-mountings and torpedo gear should be charged to the hull of the ship. The previous estimates had to be modified.

† The value of the Belleville boilers—£34,200—is included in this amount.

‡ The value of the Belleville boilers—£28,000—is included in this amount.

§ This sum is exclusive of the cost of boilers which are being manufactured by contract.

‖ An estimate only, the contract is not yet taken.

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Order of Building.	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit, putting Machinery in place.					Labour in 1892.
					Days' Work Estimated.			State of advancement in hundredths.		
					Total to build.	Number worked 1st Jan., 1892.	Proposed for 1892.	1st January, 1892.	To advance in 1892.	
				£	Number of days.	Number of days.	Number of days.			£
First class Protected Cruisers	Alger	Nov. 1887.	Cherbourg	181,500	600,000	600,000	..	100	..	..
	Isly	Aug. 1887	Brest	197,480	600,000	371,409	120,000	62	20	15,557
										15,557
Second class Protected Cruisers	Suchet	Oct. 1887.	Toulon	155,000	580,000	226,540	106,000	39	18	15,738
	Bugeaud	..	Cherbourg	*	570,000	27,206	109,000	5	19	14,918
	Chasseloup Laubat	..	Cherbourg	*	570,000	31,956	160,000	6	28	21,898
	Friant	..	Brest	*	570,000	25,000	106,000	4	18	13,742
										66,296
Second class Cruisers	New Ship.	..	Toulon	*	300,000	..	12,000	..	4	1,782
Torpedo Cruisers	Wattignies	Oct. 1889.	Rochefort	70,200	250,000	250,000	..	100	..	..
	Fleurus	..	Cherbourg	70,200	250,000	95,482	86,500	38	34	11,838
										11,838
Transport	Vaucluse	May 1886.	Rochefort	45,560	160,000	97,824	†	61	..	..
Torpedo Gunboats	Léger	Feb. 1890.	Lorient	29,800	110,000	110,000	..	100	..	..
	Lévrier	Feb. 1890.	Lorient	29,800	110,000	110,000	..	100	..	..
										..
Second class Transport	Pacifique	Aug. 1885§	Brest	110,000	400,000	69,850	‡	..	..	..
Sailing Frigate	Andromède	July 1884.	Lorient	73,200	180,000	42,528	‡	..	..	..
Submarine Boat	Sirène	..	Toulon	11,774	60,000	20,436	39.564	34	66	5,874

* The design of this ship is not approved. Only the amount of labour to be expended in 1892 is given.
† The building of this ship is suspended so as to admit of the building of other ships urgently wanted.
‡ The building of this ship is suspended, the men being employed on more pressing work.
§ The building of this ship was suspended in January, 1885, and very little has been done since.

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BUILDING in DOCKYARDS, 1892—*continued.*

Machinery.								Cost of Armament.	Total Cost of Vessel.	Total Expenditure on Labour, 1892.		
Makers.	Cost.	Days' Work.			Advancement in hundredths.		Labour in 1892.			Hulls and Fittings.	Machinery.	Total.
		To Complete.	Worked 1st Jan., 1892.	Proposed for 1892.	1st January, 1892.	Proposed for 1892.						
	£	Number of days.	Number of days.	Number of days.				£	£	£	£	£
Le Creusot.	92,835	..	..	..	..	..	..	34,116	308,451	..	..	..
Indret . .	88,000	150,000	120,334	24,000	80	16	3,696	31,396	316,876	15,557	3,696	19,253
							3,696			15,557	3,696	19,253
Indret . .	70,000	150,000	115,560	5,964	77	4	918	32,720	257,720	15,738	918	16,656
Contract .	*	..	..	..	..	..	..	..	..	14,918	..	14,918
Contract .	*	..	..	..	..	..	..	..	..	21,897	..	21,897
Contract .	*	..	..	..	..	..	..	..	..	13,742	..	13,742
							918			66,295	918	67,213
Contract .	*	..	..	..	..	..	..	..	..	1,781	..	1,781
Le Creusot.	41,767	..	..	..	..	..	..	14,720	126,687	..	..	..
Le Creusot.	40,684	..	..	..	..	..	..	18,200	129,084	11,838	..	11,838
							..			11,838	..	11,838
Indret . .	10,400	28,500	26,464	2,036	93	7	314	4,000	59,960	..	314	314
Le Creusot.	18,552	..	..	..	..	..	..	9,960	58,312	..	..	..
Le Creusot.	18,552	..	..	..	..	..	..	9,960	58,312	..	..	..
							..			..	..	..
Contract .	11,400*	..	..	..	..	..	..	2,400	123,800	..	..	..
..	..	..	..	..	..	..	..	9,320	82,520	..	..	..
Contract .	17,200*	..	..	..	..	..	..	2,000	30,974	5,874	..	5,874

* Estimate only, the contract not yet entered into.

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Building in Dockyards.

1892.

EXPENSES connected with the FIRST FITTING OUT and for ALTERATIONS and ADDITIONS CONSIDERED NECESSARY after TRIALS.

	£
Cherbourg	1,574
Brest	1,531
Lorient	578
Rochefort	531
Toulon	7,196
Indret	..
Guérigny.	15,000
Total . . .	£26,410

SUPPLEMENTAL WORK IN COMPLETING SHIPS BUILT BY CONTRACT.

1892.

Class.	Where Completed.	Number of days Estimated.			Estimated expense due to the number of days in 1892.
		For Completion.	To 1st. Jan. 1891.	Expenditure in 1892.	
					£
Torpedo Gunboats, and Torpedo Boats of all Classes .	Cherbourg	..	..	2,833	388
	Brest . .	..	..	1,000	130
	Lorient .	..	..	1,000	125
	Rochefort .	..	..	1,000	140
	Toulon .	..	..	3,000	455
					1,228

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Summary.

COST OF LABOUR IN THE DOCKYARDS AND GOVERNMENT ESTABLISHMENTS IN 1892 FOR NEW SHIPS, SHIPS CONVERTED, AND FOR FIRST FITTING-OUT OF NEW AND CONVERTED SHIPS.

1892.

	£
Armoured Battle Ships	184,671
Coast Defence Ironclads	34,054
Armoured Gunboats	17,130
„ Cruisers (1st class)	78,059
First Class Protected Cruisers	19,253
Second „ „ „	67,214
„ „ Cruisers	1,782
Torpedo „	11,838
Transports	313
Torpedo Gunboats	
Second Class Transport	
Sailing Frigate	
Submarine Boat	5,874
Cost of first fitting out, and alterations and additions to be made after trials	26,411
Completion of ships after delivery by Contractors	1,229
Totals	447,828

NOTE.—The cost of wages has been estimated upon the following averages:—

	Francs per diem.*
Cherbourg	3·375 *4·22*
Brest	3·200 *4·00*
Lorient	3·143
Rochefort	3·456 *4·325*
Toulon	3·656 *4·57*
Indret	3·850
Guérigny	3·850

* The same with overtime in *Italics*.

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Contract.	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit.			Machinery.	
					Advancement in hundredths.		Expenditure in 1891 as per Contract.	Date of Contract.	Makers.
					1st January, 1892.	To advance in 1892.			
				£			£		
Armoured Battle Ships .	Brennus .	..	Lorient . .	660,000	..	..	..	26 Mar., 1890	Belleville . Indret. .
	Magenta .	..	Toulon . .	568,800	..	..	..	4 Aug., 1884.	Le Creusot .
	Charles Martel .	..	Brest. . .	880,000	..	..	..	Not accepted	..
	Jauréguiberry .	Not accepted.	La Seyne (Société de la Méditerranée) . .	..	..	..	80,000	Do.	(Société de la Méditerranée) . .
	New Ship .	Do.	..	..	..	..	26,728	Do.	..
							106,728		
Coast Defence Ironclad	Tréhouart .	..	Lorient . .	434,800	..	..	..	Do.	Belleville . Indret. .
Armoured Cruisers (1st class)	Dupuy-de-Lôme .	..	Brest . . .	301,120	..	..	..	23 Apr., 1888.	Saint-Denis (Société de la Loire) .
	Charner .	..	Rochefort .	255,920	..	..	..	12 Mar., 1890.	(Société de la Méditerranée. . .
	Bruix . .	..	Rochefort .	255,920	..	..	..	Not accepted.	..
	Chanzy .	18 Dec., 1889.	Bordeaux (Société de la Gironde).	247,200	64	30	71,800	18 Dec., 1889.	Le Creusot et Belleville .
	Latouche-Tréville.	18 Dec. 1889.	Le Havre (Société de la Méditerranée) . .	247,200	64	30	71,800	18 Dec., 1889.	Société de la Méditerranée et Belleville .
							143,600		

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Building by Contract, 1892.

Machinery.				Cost of Armament.	Completion after delivery, including Armament.	Total Cost of Vessels.	Total Expenditure in 1891.		
Cost.	Advancement in hundredths. 1st January, 1891.	Advancement in hundredths. To advance in 1891.	Expenditure in 1891.				Hulls and Fittings.	Machinery.	Total.
£			£	£	£	£	£	£	£
Boilers. 34,200 Engines. 98,200	50	18	*5,700	160,000	..	952,000	..	5,700	5,700
125,000	100	..	†..	144,984	..	838,784	..	..	..
§111,804	..	14	16,000	96,200	..	1,088,004	80,000	16,000	16,000
..	..	..	28,000	..	..	..	..	28,000	108,000
..	..	..	..	..	..	..	26,728	..	26,728
			49,700				106,728	49,700	156,428
Boilers. 28,060 Engines. 51,800	..	36	10,000	58,000	..	572,608	..	10,000	10,000
121,740	100	..	‡..	46,150	..	469,020	..	..	..
74,936	80	20	11,393	37,860	..	368,716	..	11,393	11,393
‖74,936	10	20	16,000	37,860	..	368,716	..	16,000	16,000
80,000	52	35	22,600	37,860	10,000	375,060	71,800	22,600	94,400
80,000	66	21	13,800	37,860	10,000	375,060	71,800	13,800	85,600
..			63,793			..	143,600	63,793	207,393

* This estimate, as well as that of the proportion of work completed, has reference only to the boilers. The engines are being manufactured at Indret.

† and ‡ There only remains the balance to be paid, account being taken of late delivery and any premium earned under the contract.

§ and ‖ Estimated value only. The contract not entered into.

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SHIPBUILDING PROGRAMME.—

Class.	Names of Ships.	Date of Contract.	Where Building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit.			Machinery.	
					Advancement in hundredths.		Expenditure in 1892 as per Contract.	Date of Contract.	Makers.
					1st January, 1892.	To Advance in 1892.			
				£			£		
Protected Cruisers 1st class	Alger	..	Cherbourg	181,500	..	..	..	6 June, 1888.	Le Creusot
	New Ship	..	..	..	..	..	12,000	..	..
							12,000		
Protected Cruisers 2nd Class	Bugeaud	..	Cherbourg	..	..	..	..	Not accepted.	..
	Chasseloup-Laubat	..	Cherbourg	..	..	..	..	Do.	..
	Friant	..	Brest	..	..	..	..	Do.	..
							..		
Cruisers 2nd Class	New Ship	..	Toulon	..	..	..	..	..	..
	New Ship	..	..	..	..	..	16,000	..	..
							16,000		
Cruiser 3rd class	New Ship	..	..	..	..	..	16,000	..	..
Torpedo Cruisers	Wattignies	..	Rochefort	70,200	..	..	..	14 Nov., 1888.	Le Creusot
	Fleurus	..	Cherbourg	70,200	..	..	..	13 Feb., 1891.	Le Creusot
							..		
Torpedo Gun Boats	Léger	..	Lorient	29,800	..	..	..	7 Aug., 1889.	Le Creusot
	Lévrier	..	Lorient	29,800	..	..	..	7 Aug., 1889.	Le Creusot
							..		
Transport	New Ship	..	..	..	..	..	12,000	..	..
Submarine Boat	Sirène	..	Toulon	11,772	..	..	..	..	..

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BUILDING BY CONTRACT, 1892—*continued.*

Machinery.				Cost of Armament.	Completion after delivery.	Total Cost of Vessel.	Total Expenditure in 1892.		
Cost.	Advancement in hundredths. 1st January, 1892.	Advancement in hundredths. To advance in 1892.	Expenditure in 1892.				Hulls and Fittings.	Machinery.	Total.
£			£	£	£	£	£	£	£
92,835	100	..	†31,707	34,116	..	308,452	..	31,707	31,707
..	..	..	..	..	..	..	12,000	..	12,000
			31,707				12,000	31,707	43,707
..	..	..	12,000	..	..	..	..	12,000	12,000
..	..	..	12,000	..	..	..	..	12,000	12,000
..	..	..	12,000	..	..	..	..	12,000	12,000
			36,000				..	36,000	36,000
..	..	..	8,000	..	..	..	..	8,000	8,000
..	..	..	..	..	..	..	16,000	..	16,000
			8,000				16,000	8,000	24,000
..	..	..	..	..	..	..	16,000	..	16,000
40,567	100	..	†14,672	14,720	..	126,687	..	14,672	14,672
40,684	17	33	20,342	18,200	..	129,084	..	20,342	20,342
			35,014				..	35,014	35,014
18,552	100	..	†3,090	9,960	..	58,312	..	†3,090	3,090
18,552	100	..	†3,090	9,960	..	58,312	..	†3,090	3,090
			6,180				..	6,180	6,180
..	..	..	..	-	..	..	12,000	..	12,000
*17,200	42	58	10,000	2,000	..	30,974	..	10,000	10,000

* Estimated value only. The contract not entered into.
† Balance after receipt allowance being made for late delivery.

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SHIPBUILDING PROGRAMME.—BUILDING BY CONTRACT, 1892—*continued.*

Class.	Name.	Date of Contract.	Contractor.	Contract Price of Hull, Engines, and Armament Fittings.	Hundredths.		Expense in 1891 after delivery by Contractors.	Armament.	Labour and Material for first fitting not included in the Contract.	Total Cost.
					Completed on 1 Jan., 1891.	To be completed in 1891.				
				£			£	£	£	£
First Class Torpedo Boats	Nos. 145 and 146	2 April, 1890	Normand, of Havre	27,545	100	..	6,800*	2,468	320	30,334
	Nos. 170 and 171	26 Nov., 1890	Normand, of Havre	26,112	50	50	12,712	2,468	320	29,900
Seagoing Torpedo Boats	Six Boats	..	..	..	..	..	24,000	..	..	..
Seagoing Torpedo Boat	Archer	10 Dec., 1890	Normand, of Havre	10,000†	60	40	5,760	3,410	..	13,410
	Total						£49,272			

* Balance after delivery.

† Cost of hull only. The machinery being drawn from the Store.

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Summary.

COST OF SHIPS BUILT BY CONTRACT. COST OF MATERIALS AND MACHINERY FOR SHIPS BUILDING IN THE DOCKYARDS.

1892.

	£
Armoured Battle Ships *	156,428
Coast Defence Ironclads	10,000
Armoured Cruisers (1st Class)	207,394
Protected Cruisers (1st Class)	43,707
„ „ (2nd Class)	36,000
„ „ (3rd Class)	16,000
2nd Class Cruisers	24,000
Torpedo Cruisers	35,013
Torpedo Gunboats	6,180
Transport	12,000
Submarine Boat	10,000
Torpedo Boats	49,272
Cost of Materials and Articles for use in the Dockyards .	430,006
Alterations while building, completion after delivery by contractors, contingencies, premiums for Horse-power, Speed, and coal Consumption	*60,000
Total . . .	£1,096,000

CREDITS.

	£
Caps. 19 and 20	1,076,000
Cap. 19, the produce of sales of old material . . .	20,000
Total . . .	£1,096,000

* This item includes a sum of £8000, chargeable to Cap. 19, for payment of premiums which will become due after trials of contract-built ships.

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SUPPLEMENTARY

Class.	Name of Ships.	Date of Contract.	Where building.	Estimated Cost, exclusive of Machinery and Armament.	Hulls, Fittings, Outfit.		Machinery.	
					Expenses incurred or to be incurred in 1891.	Expenses to be incurred in 1892 according to the Contract.	Date of Contract.	Where Constructed.
				£	£	£		
Coast Defence Ironclads	Bouvines	18 Dec., 1889 and 22 Oct., 1890	La Seyne (Soc. de la Méditerranée)	415,779	58,246	66,880	18 Dec., 1889	Marseille Méditerranée) Engines. Marseille (d'Allest) Boilers.
	Jemmapes.	18 Dec., 1889 and 3 Dec., 1890	Saint-Nazaire (Soc. de la Loire)	411,670	58,557	70,480	18 Dec., 1889	Saint-Denis (Société de la Loire) Engines. Marseille (d'Allest) Boilers.
	Valmy	18 Dec., 1889 and 3 Dec., 1890	Saint-Nazaire (Soc. de la Loire)	411,670	58,246	65,280	18 Dec., 1889	Saint-Denis (Société de la Loire) Engines. Marseille (d'Allest) Boilers.
						202,640		

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VOTE FOR 1892.

Machinery.			Cost of Armament.	Total Cost of Vessel.	Total Value of the Ship not comprised in the Supplementary Works.	Total Expenditure in 1892.		
Cost.	Expenses incurred or to be incurred in 1891.	Expenses to be incurred in 1892 according to the Contract.				Hulls and Fittings.	Machinery.	Total.
£	£	£	£	£	£	£	£	£
77,600	12,400	21,200	58,000	551,379	26,000	66,880	21,200	88,080
77,600	12,400	17,600	58,000	547,270	26,000	70,480	17,600	88,080
77,600	12,400	8,800	58,000	547,270	26,000	65,280	8,800	74,080
		47,600				202,640	47,600	250,240

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SUPPLEMENTARY VOTE FOR 1892—*continued.*

Class.	Name.	Dates of Contract.	Where Constructed.	Contract Price of Hull, Engines, and Armament Fittings.	Expenses incurred or to be incurred in 1891.	Expenses to be incurred in 1892 after the Contract.	Armament.	Total Cost.	Labour and Material for first fittings not included in the Contract.
				£	£	£	£	£	£
Torpedo Gunboats of 850 tons displacement.	Cassini	.. ..	..	..	10,040	10,000	..	..	..
	D'Iberville	.. ..	..	..	10,040	10,000	..	..	..
						20,000			
Seagoing Torpedo Boats	Dragon, Grenadier, Lancier.	9 April and 19 Nov., 1890	Havre	60,360	11,350	20,000	10,110	70,470	480
	Turco, Zouave	16 April and 3 Dec., 1890	Nantes	38,260	10,310	9,440	6,740	45,000	320
	Éclair, Kabyle, Orage	21 May and 17 Dec., 1890	La Seyne	54,181	10,826	17,600	7,476	61,617	480
	Sarrasin, Tourbillon	9 April and 24 Dec., 1890	Bordeaux	34,995	9,270	8,400	4,984	39,979	320
						55,440			
First Class Torpedo Boats	Nos. 147 to 149 and 152 to 154	2 April and 19 Nov., 1890	Havre	86,536	22,766	21,600	14,808	101,344	960
	Nos. 155 to 157	9 April and 3 Dec., 1890	Bordeaux et Paris	40,548	5,374	20,160	7,404	47,952	480
	Nos. 158 to 160	9 April and 3 Dec., 1890	Bordeaux et Paris	40,548	5,374	20,160	7,404	47,952	480
	Nos. 161 to 163	16 April and 3 Dec., 1890	Saint-Denis	40,548	10,800	10,800	7,404	47,952	480
	Nos. 164 to 166	9 April and 19 Nov., 1890	Havre	41,862	10,800	10,800	7,404	49,266	480
	Nos. 167 to 169	22 April and 3 Dec., 1890	Creusot	40,148	10,800	10,800	7,404	47,952	480
						94,320			

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Summary.

PROVISION MADE IN THE SUPPLEMENTARY VOTES OF 1892 FOR THE BUILDING OF SHIPS BY CONTRACT.

	£
Coast Defence Ironclads	250,240
Torpedo Gunboats	20,000
Seagoing Torpedo Boats	55,440
First Class Torpedo Boats	94,320
Total	£420,000

CREDITS.

	£
Sum allowed in Estimates	400,000
The produce of sale of old materials	20,000
Total	£420,000

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XII.

Italian Estimates, 1891-92.

Navy Estimates.—Financial Year 1st July, 1891, to 30th June, 1892.

Ordinary Expenditure—General Expenses.

	1891-2.	1890-1.
	£	£
Admiralty	37,886	37,040
Expenditure on various services connected with the Mercantile Marine	283,163	266,720
Totals	321,049	303,760
Expenditure for Naval Services.		
Ships fitting out, in reserve and completing	186,535	237,164
General Staff of the Navy	110,978	109,730
Corps of Constructors	41,360	41,539
Commissariat Service	42,765	43,196
Medical Service	24,708	25,160
Wages—Men	402,406	451,085
Gratuities	33,000	31,500
Assistants to Constructors	41,928	38,479
Accountants	23,798	12,177
Police	10,761	10,761
Telegraph Service	8,679	9,240
Telegraph Materials	8,800	8,800
Provisions	262,072	349,533
Lighting	9,092	8,307
Hospital Services	19,374	22,910
Honorary Distinctions	1,020	1,020
Fuel	142,800	134,000
Salaries and Wages—Workshops and Fortifications	12,032	12,312
Training Establishments	30,160	30,081
Naval Academy	13,000	13,000
Scientific Services—*Personnel*	3,185	3,932
„ „ *Matériel*	13,186	15,640
Law Charges	1,220	1,220
Carried forward	£1,442,859	1,610,786

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	1891-2.	1890-1.
	£	£
Brought forward	1,442,859	1,610,786
Transport	45,680	49,680
Materials for repair of Ships	316,000	451,400
Labour for same	249,232	300,000
Guns, Torpedoes and Small Arms	408,000	307,200
Labour for construction and repair of Armaments . .	95,648	68,000
Works Department—Repairs	67,600	87,600
Completion, 1st class Battle Ship (Re Umberto) . . .		
Completion, 3rd „ „ Ships (2)		
Building three 1st class Ships		
„ nine 2nd „ „		
„ six 3rd „ „		
„ Sea-going and Harbour Defence Torpedo Boats .		
„ Tenders and Harbour Vessels		
„ Steam Launches.	1,080,000	1,080,000
Ships to commence:—		
Two 1st class Ships		
Four 3rd class Ships		
Sea-going Torpedo Boats		
Tenders.		
Steam Launches		
Naval Expenditure at Massowah	38,800	106,010
Total . . . . £	3,743,819	4,060,706
Rents for lands occupied by Government	95,045	93,756
Extraordinary Expenditure.		
	£	£
Half Pay.	4,000	4,000
Shipbuilding	36,000	256,000
Naval Yard at Taranto	40,000	40,000
Works at Dockyard, Spezzia	48,000	50,000
„ „ Venice	..	10,000
Fortifications, Maddalena	..	64,000
Torpedoes	40,000	60,000
Quick-firing Guns	..	20,000
	£164,000	500,000
Summary.		
	£	£
Admiralty and Mercantile Marine	321,049	303,760
Naval Services	3,743,819	4,060,706
Rent of land occupied by Government	95,045	93,756
Extraordinary Expenditure	764,000	500,000
Grand Totals . . . . £	4,323,913	4,958,222

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XIII.

German Navy Estimates, 1891-92.

ORDINARY PERMANENT ESTIMATES.

	1891-92.	1890-91.
	£	£
Naval Cabinet and Chief Command Department.	3,065	46,077
Imperial Naval Office	44,484	
Observatories	11,684	11,790
Salaries, Wages, &c., Scientific Department	11,701	10,810
Martial Law	1,507	1,477
Divine Service.	2,547	2,370
Military Personnel	496,623	472,158
Maintenance of Ships and Vessels in Commission	434,510	342,915
Victualling	168,892	144,394
Clothing	5,728	5,715
Barrack Administration	51,442	47,855
Lodging Allowance	39,773	38,095
Medical	32,997	32,000
Travelling Expenses, Freight Charges, &c..	26,062	25,462
Training Establishments	8,329	8,095
Dockyard Expenses	608,814	517,485
Ordnance and Fortification	115,205	108,141
Torpedo and Mining Service	56,031	78,133
Pilotage, Buoys, and Lights	10,852	10,197
Miscellaneous Expenses	10,685	10,129
Total	£ 2,140,931	1,914,379

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Special Ordinary Estimates.

Shipbuilding Programme, 1891–1892.

For the Construction of—	£
Cruiser Corvette H., 4th instalment	95,000
Armourclad A., 3rd instalment	200,000
„ B., „ „	200,000
„ C., „ „	200,000
„ D., „ „	155,000
Armoured Vessel P., 3rd and last instalment	80,000
„ „ Q., 3rd instalment	50,000
„ „ R., 2nd instalment	75,000
Cruiser Corvette J., 2nd instalment	75,000
„ „ K., „ „	75,000
Cruiser E., 2nd instalment	37,500
„ Ersatz Adler, 2nd and last instalment	30,000
„ „ Eber, „ „	30,000
Aviso (to replace Hohenzollern) 2nd instalment	100,000
Armoured Vessel S., 1st instalment	50,000
„ „ T., „ „	75,000
„ „ U., „ „	50,000
Cruiser F., 1st instalment	25,000
Aviso H., „ „	50,000
Torpedo Boats	110,000
Total	£1,762,500

Items other than Shipbuilding.

	£
Construction of a Floating Steam Crane, 2nd and last instalment	15,500
Building a Vessel for surveying purposes in the Baltic	2,600
Gun Armament of the Armourclads A., B., C., D., 2nd instalment	200,000
„ „ the Armoured Vessels P., Q., R., 2nd instalment	37,500
„ „ Cruiser Corvette H., 2nd instalment	12,500
„ „ Armoured Vessels S., T., U., 1st instalment	50,000
„ „ Cruiser Corvettes J., K., 1st instalment	40,000
„ „ Cruiser E.	14,700
„ „ Aviso H.	5,500
„ „ a Transport Steamer	5,500
„ „ the Aviso to replace the Hohenzollern, 1st instalment	8,550
Equipment and arming of Ships of War for using torpedoes	71,750
Carried forward	£464,100

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SPECIAL ORDINARY ESTIMATES, 1891–92—*continued.*

Items other than Shipbuilding.

	£
Brought forward. . . .	464,100
New buildings and repair of old buildings of Torpedo and Mine Department	11,020
Transfer and enlargement of the Mine Depôt at Friedrichsort, 4th and last instalment	9,868
Fitting up Torpedo Instructional Establishments	2,000
For further adaptation and improvement of the present old Mining Material, 1st instalment	11,000
Building two Dwelling-houses for Torpedo and Mine Department at Friedrichsort	5,000
Building a Reserve Caisson for Dry Docks I. and II. at Wilhelmshaven, 2nd and last instalment	3,300
Making a Torpedo Boat Storeroom in reserve Magazine for Armour-clads at Kiel	800
Making a second Pontoon for the Torpedo-boat Floating Dock at Kiel	3,000
Enlarging Workshops in the Dockyard at Wilhelmshaven, 1st instalment	2,650
Enlarging the Building for the Electric Light Apparatus at Wilhelmshaven	1,250
Building a new Office in the Dockyard at Wilhelmshaven . .	3,100
Enlarging the Metal Foundry premises at Wilhelmshaven . .	1,200
Building an Iron Floating Dock for Torpedo Boats at Wilhelmshaven, 2nd and last instalment	1,250
Building an Iron Caisson for Slip I. at Danzic	3,000
Establishment of Electric Light Apparatus at Danzic . . .	5,000
Enlargement of Boiler House at Danzic Yard	1,900
Establishment of Boilers on Shore for getting up steam in Torpedo Boats laid up in the Yards at Kiel and Wilhelmshaven . .	3,125
Building a Coppersmith's and Tinsmith's Workshop at Kiel . .	5,450
Erection of Cranes, &c., in the Torpedo Boat Harbour at Kiel . .	1,000
Building a Coal Store in the New Harbour at Wilhelmshaven. .	10,400
Building two Dwelling-houses at Kiel, 2nd instalment . . .	28,750
Building a Landing Pier in Kiel Harbour	1,450
Completion of Barrack and Hospital Stores necessary in the event of War	5,845
Improvement and alteration of Danensfeld Sewer at Wilhelmshaven, 1st instalment	10,000
Acquisition of a House for the use of the Chief Command Department	51,250
Furniture for Residence of the Commanding Admiral . . .	1,350
Building new Quarters for the Chronometer-testing Institute at Hamburg	2,000
Total	£650,058

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Extraordinary Estimates, 1891–92.

	£
Making Guns, Mountings, and Ammunition for Lower Elbe Defences, 3rd instalment	35,000
Making Guns, Mountings, and Ammunition for Wilhelmshaven Defences, 1st instalment	28,000
Making 30 Torpedoes	12,000
Fitting up War Vessels for Mining Service, 2nd instalment	3,500
Making submerged Torpedo Batteries on the North Sea Coast	13,750
Making Booms, &c.	6,000
Completion of Mine Depôt at Cuxhaven	1,150
Building Workmen's Dwellings at Friedrichsort	17,050
Continuation of Buildings of Naval Establishment at Ellerbeck, 18th instalment	7,800
Building a second Gun Store at Wilhelmshaven, 2nd instalment	10,000
Making a New Harbour for use of Torpedo Boats, &c., at Wilhelmshaven, 1st instalment	4,500
Surveys and Schemes, &c., for New Docks	1,800
Total	£140,550

Summary.

	1891–92.	1890–91.
	£	£
Ordinary Permanent Estimates	2,140,931	1,914,379
Ordinary Special Estimates—		
Shipbuilding	1,762,500	2,365,601
Other Items	650,058	
Extraordinary Estimates	140,550	159,077
Total £	4,694,039	4,439,057

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XIV.

Russian Navy Estimates, 1891.

CALCULATED AT £1 = 9 Roubles.

	1891.	1890.
	£	£
Central Administration	196,390	198,198
Rewards, Pensions, Education of Children	50,656	52,295
Naval Schools	59,787	59,972
Medical	81,732	82,343
Wages	373,280	391,714
Provisions	112,978	97,290
Clothing	129,102	103,380
Navigation	581,897	585,353
Hydrographic Office	50,377	37,885
Guns and Torpedoes	438,249	315,355
Construction	1,947,286	1,555,662
Workshops and Offices	280,868	274,372
Hire, Maintenance, Construction, and Repair of Buildings	402,974	341,244
Religion	56,252	39,157
Sundries	100,374	100,417
Total £	4,862,202	4,234,737

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XV.

Report of the Secretary of the United States Navy for 1890.

(Given in the *Army and Navy Journal* of 6th December, 1890.)

THE annual report of the Secretary of the Navy is a very able and interesting document and we hope that it will receive from Congress the attention which its importance deserves. General Tracy reports that during the twenty months covered by the present administration nine new ships have been put in commission; four, including one monitor, have been advanced to a point where they are just about to go into commission; five are in such a condition that they will shortly be waiting only for their armour; seven have been built from the keel up, of which the Texas and Monterey are nearly ready for launching, and the five cruisers are well advanced; while of the six others previously authorized all have been designed and advertised, and all but one, the ram, have been contracted for and are actually under construction. The first five vessels on the list—the Chicago, Yorktown, Petrel, Charleston, and Baltimore—have been actively cruising, and all have justified, under the severe test of actual practice, the high expectations which were formed of their efficiency as seagoing men-of-war. Of the last four vessels placed in commission, the torpedo-boat Cushing, built by the Herreshoff Manufacturing Company of Bristol, R.I., is the first, and as yet the only craft of this description in the Navy, although a second has been authorized. She not only compares favourably with foreign torpedo-boats, but stands very near the head of her class. If this country had twenty others like her they would be a material addition to its means of defence.

Progress made.

France has built, building or projected, 210 torpedo-boats; England, 206; Germany, 180; Italy, 152; Russia, 143; Austria, 61; Greece, 51; Holland, 50; Denmark, 34; China, 32; Norway and Sweden, 31; Turkey, 30; Japan, 24; Spain, 15; and Brazil, 15.

Foreign torpedo-boats.

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Dynamite Cruiser.

The Vesuvius is still an experiment, the trial of her dynamite guns and the tactical test of the ship having been delayed by the want of projectiles, which the company has thus far been unable to supply.

Details are given concerning the other vessels of the Navy with which our readers are already familiar. In considering them the Secretary finds occasion for congratulation in the fact that it is no longer necessary, in considering the speed of the new ships of the Navy, to make comparisons with foreign vessels. We have now our own standard, and we have the right to congratulate ourselves that the standard is unsurpassed by any other Navy in the world.

Monitors.

The monitors now building are all expected to be in commission some time in 1892, the Miantonomoh in three months. In the Puritan, Amphitrite, and Monadnock barbettes have been substituted for roller-base turrets.

The new designs.

Attention is called to the promptness shown by the Naval Bureaus in preparing the designs for the new vessels authorised by the present Congress. It is unexampled in the history of naval administration in this country. In the battleships designed the Department confidently asserts that the United States will possess three vessels of the highest power, whose equal as fighting ships does not exist at the present day. As designed they challenge comparison with the battleships of the world. There are others in existence of greater size; none of greater power or efficiency.

Vessels to be completed 1893.

The Department hopes to have ready the following vessels in season to participate in the Columbian Review of April, 1893, in New York Harbour, the greatest demonstration ever held in the Western Hemisphere :—

Armoured Vessels.

Rate.	Name.	Type.	Tons.
1st	New York	Cruiser	8150
	Maine	,,	6648
	Texas	Battleship	6314
	Puritan	Monitor	6060
2nd	Monterey	,,	4003
	Amphitrite	,,	3815
	Miantonomoh	,,	3815
	Monadnock	,,	3815
	Terror	,,	3815
3rd	Harbour-defence Ram	.. ..	2050

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Unarmoured Vessels.

Rate.	Name.	Type	Tons.
1st	Cruiser No. 6	.. ..	5500
2nd	Chicago.	Protected Cruiser	4500
	Baltimore	„ „	4400
	Philadelphia	„ „	4300
	Newark.	„ „	4083
	San Francisco	„ „	4083
	Charleston	„ „	3730
	Boston	Cruiser	3189
	Atlanta	„	3189
	Raleigh	„	3000
	Cincinnati	„	3000
3rd	Cruiser 9	„	2000
	„ 10	„	2000
	„ 11	„	2000
	Bennington	Gunboat	1700
	Concord	„	1700
	Yorktown	„	1700
	Dolphin	„	1485
	Gunboat No. 5	„	1000
	„ No. 6	„	1000
4th	Vesuvius	Dynamite Gun Vessel	970
	Petrel	Gunboat	870
	Practice Vessel	„	835
	Torpedo Cruiser	„	750
	Cushing	Torpedo Boat	100
	Torpedo Boat No. 2	.. ..	112

The Bethlehem Iron Company has utterly broken down in the attempt to fulfil its contract for armour, and remonstrance, solicitation and urgent request have been powerless to hasten the performance of the work. October 1, 1891, is now fixed as the earliest date at which deliveries can begin.

Failure in delivery of armour.

Accordingly negotiations were opened with Messrs. Carnegie, Phipps, and Co., the largest steel manufacturers in the United States, if not in the world, with a view to the establishment of another plant; and an agreement has been concluded with this firm for the manufacture of 6000 tons of armour, at the same price as in the contract of 1887 with Bethlehem, to be of all steel or nickel steel, at

A new firm contracts for armour.

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the option of the Department. The contract binds the firm to begin the delivery of armour in June next, and to deliver 500 tons per month thereafter. If both companies deliver at the maximum rate called for by the contracts it will require over two years from July, 1891, to complete the manufacture of the armour required for the ships now authorized, and some of them will be ready for it in advance of the time.

Tests of armour.

In examining the competitive tests of different kinds of armour in Europe, the Department was impressed by the fact that these tests had been largely controlled by the manufacturers who furnished the plates, and were, therefore, not fully to be relied upon as indicating comparative merits. In some cases the tests were made for the benefit of the armour, and the gun used was carefully adjusted to the armour's known capacity of resistance. Other tests, equally untrustworthy, had been directed to proving the superiority of the ordnance, and in these the plate was adjusted with equal care to the necessities of the gun. The Department therefore determined to have a complete test, not only of the new plate, but of those varieties of armour at the time in the market and in actual use in different navies.

Annapolis trials.

The results of these trials at Annapolis we have fully reported. The striking results obtained with the nickel steel plate has thus far led to the purchase of about £12,000 worth of nickel for experiment. The Department has directed the Bureau of Ordnance to institute experiments with small samples of nickel steel, varying in their composition, for the following purposes:—

(*a*) Construction plate similar to that used in shipbuilding.

(*b*) Boiler plate.

(*c*) Construction plate which shall be used in a comparative test with the ordinary steel plate, as to its non-fouling qualities, when used as bottom plates of steel vessels.

(*d*) Metal for projectiles.

What is said in the report upon the subjects of ordnance and torpedoes is substantially a repetition of the report of the Bureau of Ordnance, of which we have already given a synopsis. Particular attention is called to the reduction in the cost of making guns and carriages at the gun factory. Under the contract with the Ericsson Coast Defence Company, it is proposed to make a thorough test of this system of submarine artillery, which possesses undeniable advantages, if applied to special types of vessels, such as the ram designed for work at close quarters. The experiments will be conducted at the torpedo station at Newport.

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To meet the objections of the manufacturers of steel the force of inspectors is to be increased and their liberty of action enlarged. Inspection increased.

The arguments for an increase of the *personnel* of the navy already presented here were urged upon the attention of Congress. There should be ten admirals instead of six.

The situation of the lower part of the list of line officers in the grades of lieutenant and ensign is so serious as to be little less than alarming. The average age of the five officers now at the head of the list in each of these grades is as follows:— Promotion of officers.

	Yrs.	Mos.
Lieutenant	44	1
Lieutenant, Junior grade	34	5
Ensign	32	7

This is bad enough, but the situation during the next few years is growing rapidly worse, and actual calculation shows that, at the average rate of promotion, the officers now at the foot of these grades will only be promoted out of their grades at the following ages:—

	Years.
Lieutenant	54
Lieutenant, Junior grade	37
Ensign	33

The spectacle will thus be presented, at a time not very far distant, of the whole grade of lieutenants in the navy composed of men between the ages of thirty-seven and fifty-four. During all this period they can only have a subordinate responsibility, although they have reached an age when many men are almost ready to retire from the pursuit of an active career. They are still in leading-strings, always compelled to refer even unimportant questions to their seniors, dragging out the miserable existence of a subordinate whose energies have been sapped, whose ambition is gone, and who has learned from long experience to evade and shirk responsibility. If this practice continues, the Government will soon find itself possessed of a fleet of the highest qualities placed in the hands of a body of officers originally inferior to none in the world, but with a capacity that has been dwarfed and stunted by the results of this restrictive legislation.

As a partial remedy the Department proposes that the number of lieutenant-commanders be increased from 74 to 124, and the number of lieutenants be diminished in like proportion; and that the number of lieutenants of the junior grade and of ensigns be more nearly equalised. Partial remedy.

It is also urged that the Bill (S. 540) now pending in Congress to

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Status of commanders of ships.

amend the statutes relating to the naming, rating, and command of vessels be so amended that second-rates may be commanded by captains or commanders, third-rates by commanders or lieutenant-commanders, and fourth-rates by lieutenants.

The Bill for the increase of the Engineer Corps is urged upon the attention of Congress.

The estimates for the year are £270,520 less than those of last year, £31,175 less than for this year. For the increase of the navy the estimates are nearly double, or £3,694,246 against £1,877,260.

Owing to the large accumulation of vessels uncompleted, some of them not yet begun, which the present Administration of the Department found in March, 1889, awaiting its action, together with a number of large vessels authorised in the Act of last summer, all of which have been got under way, an immense banking up of contract work in the fiscal year 1892 has taken place for which Congress is now called upon to appropriate.

The Department renews its recommendation that an Act be passed consolidating the Revenue Marine Service with the Navy. The Act now before Congress, which has passed the House, has been carefully drawn, and the Department earnestly recommends its passage.

Increase of the Navy.

Concerning the increase of the navy, Secretary Tracy says:—

"Whatever line of construction Congress should now deem it best to follow up, the Department would draw especial attention to the necessities of the most vulnerable points along the coast, with a view of providing, as far as possible, for the protection of the enormous interests at stake in those localities. . . .

Inadequate defence for coasts.

"There is no other instance in the world at the present time of so much wealth in so exposed a situation. To protect it requires a combination of guns afloat and guns on land. . . .

"The harbour of New York at the present time is entirely defenceless. . . . There is nothing to prevent the access of a fleet to New York by either the eastern or the southern entrance. . . .

"The terms of ransom would undoubtedly include the surrender of all the shipping, naval or mercantile, in the port. In the case of New York, it is hard to say what limit would be fixed to a ransom, and Brooklyn and Jersey City would contribute their shares.

"But the calamity would not end with the payment of money and the surrender of ships. An enemy's fleet once in the waters of New York would remain there. Commerce would be annihilated. Communication would be absolutely cut off. The ferryboats would cease to run. The Brooklyn Bridge would be closed to traffic as

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the condition of its preservation. Finally, the railway communications would be cut, and the food supply of two and a-half millions of people would come to an end. . . .

"Those who recall the scarcity caused by the snow blockade in the great storm of March, 1887, may form some idea of the effect of absolute stoppage of communication. Starvation would be only a question of days.

"The present statement is revealing no secret; at least no secret to foreign States. It is only our own people who ignore it. . . .

"Our line of defence is long, and its parts are so divided and so remote that they could not be included in any single plan of concerted operations. Each would inevitably become the object of separate attack, and each must be effectively and separately guarded. Nothing short of a force of battle-ships, numerous enough to be distributed in the separate fields of attack and able to concentrate on any threatened point within their own field, will prove a complete protection. . . .

"If such a plan should be adopted it is reasonable to believe that Boston, New York, Philadelphia, Baltimore, New Orleans, San Francisco, and the cities on Puget Sound would become centres of naval strength instead of being, as they are to-day, conspicuous examples of maritime weakness, and inviting objects of maritime attack; while these local forces, organised in complete harmony with the spirit of American institutions, would be welded together and transfused with the spirit of naval discipline by the small but efficient standing force which the country will always maintain.

"In conclusion I would repeat here the proposition that was laid down at the opening of my report last year, that 'the purpose for which the United States maintains a navy is not conquest, but defence.' The best guaranty of peace is a judicious expenditure for the navy, such as will meet the necessities of the country. At the present time it has not such a force, nor will it have the force required even when all the ships now authorised are completed. The problem of naval construction has been simplified almost beyond belief in the last eight years. It only remains to add to the number of vessels of types already in existence.

"The price is not too high to pay if it affords the means whereby the United States, for the first time in many years, may be enabled to preserve and defend its rights. War is a great calamity, but it is not the greatest calamity that can befall a free, intelligent, and self-respecting people."

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Estimates for the Army and Navy.

The following are the estimates, by titles, of appropriations required for the support of the naval establishment for the coming fiscal year, together with the appropriations for the current year:—

Naval Establishment.

	Estimates for 1892.	Appropriated for 1891.
	£	£
Pay of the Navy	1,510,948	1,498,000
Contingent of the Navy	1,400	1,400
Increase of the Navy	3,694,246	1,795,000
Bureau of Navigation	25,150	19,800
Naval War College	2,000	2,000
Gunnery Exercise	2,000	1,200
Ordnance and Ordnance Stores, Repairs, Torpedo Station, Civil Establishment and contingent, Bureau of Ordnance	84,008	50,725
Reserve Supply of Projectiles	12,000	..
Bureau of Equipment	208,805	187,805
Bureau of Yards and Docks	62,885	60,797
Naval Home, Philadelphia	15,659	14,623
Bureau of Medicine and Surgery	25,000	25,000
Medical Director's Residence, Mare Island, Cal.	3,100	..
Bureau of Provisions and Clothing	248,516	234,706
Bureau of Construction and Repair	203,994	203,994
Bureau of Steam Engineering	142,980	132,580
Improvement of Plant, Norfolk Navy-yard	9,852	..
Experimental Purposes	5,000	..
Naval Academy	42,796	39,803
Marine Corps	203,311	187,617
Total Naval Establishment	6,501,641	4,453,051

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INDEX.

A.

"A" Fleet—Naval manœuvres, 16, 21, 22.
Abel, Sir F., on explosives, 318.
Accidents with melinite, 319.
Achéron, Plate 51.
Achilles, steam trials of, after refit, 130.
Act, Naval Defence, 87–96.
Aden, defence of coaling station, 83.
Administration, British Naval, superior economy of, 52.
——— Naval, 43–48.
——— ——— abroad, 44.
——— ——— Austria, 45.
——— ——— France, 44.
——— ——— Germany, 45.
——— ——— Italy, 45.
——— ——— Russia, 45.
Administrative efficiency, 49–58.
Admiral de la Gravière on the qualifications required in Naval officers, 66.
——— Nachimoff (Russian), plate 76.
Admiralty, Assistant Controller of Navy recommended, 44.
——— Board of, 43 *et seq.*
——— distribution of business at the, 43.
——— Intelligence Branch, 45.
——— Mr. Forwood at the, 43.
——— position of First Sea Lord, 44.
Adye, Sir A., on transfer of ordnance stores, 47.
Æolus, Plate 3.
Agamemnon, Plate 2.
Ajax, Plate 2.
Alexander II. (Russian), Plate 79.
Alexandra, Plate 1.
Alger, Plate 55.
Almirante Brown, Plate 31.
Almirante Oquendo (Spanish), description of, 141, and Plate 84.
America (United States), ships of, Plates 87–95.
American and Russian armour-plate competitive trials, 285.
——— Revolution, war of, note on, 151.
Amide powder, 319.
Amiral Baudin, Plates 40, 41.
——— Duperré, Plate 42.
Anderson's muzzle-pivoting mounting, 311.
Andrea Doria (Italian), Plate 68.
Andromache, Plate 3.
Annapolis, competitive trials of armour, 286 (Plates II., III.).
Anson, Plate 10.
Apollo class, Plate 3.
——— vessels now being built, 90, 91.
——— type, remarks on the, 133.
Argentine Republic, additions to Navy, 5.
——— ——— Cammell's plates for, 292.
——— ——— list of ships of, 193.
——— ——— ships building for the, 144–146.
——— ——— ships of, Plate 31.
Arm, the magazine, 327–329.
Armaments of battle-ships of the future, 105.
——— Naval, 1891–92, estimates for, 390.
Armed merchant cruisers, complements for the, First Lord on, 371.
Armour and armour experiments, 283–299.
——— British, compared with foreign, 290.
——— competitive trials of, 286–288 (Plates II., III., IV., V.).
——— compound, is it to be condemned? 291.
——— distribution of, 106.

Digitized by Google

Armour, firing at, general rules for, 297.
——— First Lord on, 352.
——— M. Weyl on, and the use of nickel, 6.
——— piercing projectiles, 295.
——— plate competitive trials, 285.
——— ——— experiments, First Lord on, 366.
——— plates, future prospects of English and foreign, 289.
——— protection of the Royal Arthur, 131.
——— thickness of, 106.
——— and Ordnance, 283–348.
Armoured cruisers, 103.
——— ——— illustrations of, *Frontispiece*, 4, 94.
——— and unarmoured fighting ships laid down to build since 1885, 413–415.
——— ——— tables of, 153–280.
——— ——— ——— foreign, tables of, 191–280.
——— ships, Argentine Republic, list of, 193.
——— ——— Austria, list of, 194.
——— ——— Brazil, list of, 198.
——— ——— Chili, list of, 201.
——— ——— China, list of, 203.
——— ——— Denmark, list of, 206.
——— ——— France, list of, 209–213.
——— ——— Germany, list of, 224, 225.
——— ——— Great Britain, list of, 156–166.
——— ——— Greece, list of, 229.
——— ——— Italy, list of, 232, 233.
——— ——— Japan, list of, 237.
——— ——— Netherlands, list of, 241, 242.
——— ——— Norway, list of, 246.
——— ——— Portugal, list of, 249.
——— ——— Russia, list of, 253–255.
——— ——— Spain, list of, 262, 263.
——— ——— Sweden, list of, 268.
——— ——— Turkey, list of, 271.
——— ——— United States, list of, 274, 275.
Army and Navy Gazette, on gun practice, Naval manœuvres, 13.
——— ——— ——— on Naval manœuvres, 24.
Army and Navy Gazette, on Naval power, 59, 60.
——— ——— guns supplied by War Department, 1888–89, 332–335.
——— ——— *Journal* on Captain Mahan's book, 147.
Artificers and engineers, position of, 74.
Artificers of the Navy, duties of, 74.
Artillery Volunteers, Royal Naval, 70.
Ascension, defence of coaling station, 83.
Assistant Controller of Navy recommended, 44.
Astræa class, note on, 90, 91.
Atlanta (U. S. ship), Plate 87.
Attack of armour, General rules for the, 297.
Aurora, Plate 4.
Australia, Plate 4.
Australian flotilla, First Lord on, 352, 353.
Austria, list of ships of, 194–196.
——— Merchant Marine of, 95.
——— Naval administration, 45.
——— ships launched, 5.
——— ships of, Plates 32, 33.
Austrian Almanack on comparative strength of navies, 100.
——— Naval Ordnance, Table of, 336.
Auxiliaries to battle-ships, 102, 103.
Auxiliary steamers, Russia, list of, 260.

B.

"B" Squadron, Naval manœuvres, 16.
Balloons, value of, 114.
Baltimore (U. S. ship), Plate 88.
Barba, M., on Armour, 289.
Barfleur and Centurion, 109.
Barfleur, second-class battle-ship, description of, 122, 123, Plate 8.
Battle-ships, armament of, 90.
——— first-class, 102, 104.
——— for United States, 4.
——— heavy guns for, 105.
——— limit of dimensions in, 106.
——— now building, table of, 119.
——— of the future, armaments of, 105.
——— of the future, dimensions of, 109.
——— second-class, 103, 104.

Digitized by Google

Battle-ships, second-class, description of, now building, 122, 123.
Belgium Navy, note on, 197.
Belleisle, Plate 6.
Benbow, Plates 5, 6.
Beresford, Lord Charles, on National Insurance, 61.
Biles, Mr., on the new battle-ships for U. S., 141–143.
Blake, Plate 7.
Blenheim, Plate 7.
Blenheim, launching of, 1.
Board of Admiralty, 43, *et seq.*
Boat-hoisting machinery in Vulcan, 134–136.
Boiler tubes in English vessels, 57.
Boilers in British Navy, 7.
——— new type, First Lord on, 359.
Bombay, dock at, 9.
——— ——— First Lord on, 367.
Bombe, Plate 56.
Boston (U. S. ship), Plate 87.
Bouvines, Plate 43.
Bowden-Smith, Admiral, on training of naval officers, 65.
Brazil, list of ships of, 198–200.
——— ships of, Plate 34.
——— ships launched, 5.
Breast-plates, Holtzer's, 296.
Brennan torpedo, 9.
Brilliant, Plate 3.
Brin, Signor, on formation of a fleet, 116.
Britannia, floating school of, 66.
British and foreign armoured and unarmoured ships, tables of, 153–280.
——— ——— guns, tables of, 332–346.
——— armour compared with foreign, 290.
——— coast defence vessels must be seaworthy, 111.
——— Empire, dependence of, on Navy, 60.
——— ——— merchant marine of the the, 95.
——— French and Russian ships, comparative tables of, 420–429.
——— guns, B. L. and M. L. (perforations), 298, (Plates VI., VII.).
——— maritime force, Napoleon on, 79.
——— programmes of shipbuilding, &c., 392 *et seq.*
——— Rifled Ordnance, table of, 334, 335
British naval administration, superior economy of, 52.
——— ships, Plates 1 to 30.
Broad Arrow on gunnery practice, naval manœuvres, 13.
Brown prismatic or "Cocoa" powder, 318.
Bruix class, Plates 44, 45.
Bulgaria naval force, note on, 200.

C.

"C" Fleet—Naval manœuvres, 16, 17, 26.
Cadets in masted ships, 66.
Caiman (French), 2, and Plate 46.
Cammell or Wilson compound plate, 287.
Cammell's 8-in. plates for Argentine Cruiser, 292.
Camperdown, Plate 10.
Canadian Nickel, 290.
Canet and other French ordnance, 304.
Canet, 15-cm. gun on centre-pivoting mounting, 304, (Plate XII.).
Cape, the, defence of coaling station, 83.
Captain Prat, Plate 35.
Capture of private property at sea, 62.
Cast steel projectiles, 295.
Catherine II. (Russian), Plates 77, 78.
Cécille (French), 2.
Centre-pivoting carriage, 304 (Plate XII.).
Centurion, second-class battle ship, description of, 122, 123, Plate 8.
Cerberus (Colonial Marine), Plate 9.
Chanzy, Plates 44, 45.
Charlestown (U. S. ship), Plate 89.
Charnier, Plates 44, 45.
Chen Yuen, Plate 37.
Chicago (U. S. ship), Plate 90.
Chili, list of ships of, 201, 202.
——— ships of, Plates 35, 36.
——— ships launched, 5.
China, list of ships of, 203–205.
——— ships of, Plate 37.
——— squadrons for, 5.
Chinese Navy, squadrons for, 5.
Chrome steel plates, 296.
——— ——— projectiles, Holtzer's, 317, 318.

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Clarke, Major, on National Insurance, 61.
Cleveland, Admiral, on training of Naval officers, 65.
Coal consumption, Naval manœuvres, 17.
——— supply and speed, 104.
Coaling arrangements, First Lord on, 367.
——— at sea, 82.
——— ———, Naval manœuvres, 18, 26.
——— stations, 83–86.
——— ——— armaments for, 83, 84.
——— ——— capture of enemy's, 99.
——— ——— defence of, 83.
——— ——— ——— ———, 9.
——— ——— garrisons for, 84.
——— ——— map showing, 84.
——— ——— state of defences, 83.
——— ——— under Naval control, 84, 85.
——— ——— utilisation of marines for, 86.
Coast defence, flotilla for, 110.
——— ——— iron-clads, 103.
"Cocoa" or brown prismatic powder, 318.
Cocyte, Plate 51.
Colbert, Plate 54.
College for training for Mercantile Marine, 71.
Colliers, Naval manœuvres, 17, 18.
Collingwood, Plate 10.
Colomb, Admiral, on training of Naval officers, 65.
Colonial Marine, list of ships, 190.
Colossus, Plate 11.
Commerce, protection of, 95, 98, 99.
——— ——— coaling at sea, 82.
"Commerce Destroyer," or "The Pirate," description of, 143, 144.
Commerce destroying war, 150.
Commissions, length of, 77.
Committee of engineers, First Lord on, 361.
Comparative statement showing expenditure on construction, &c., England and France, 430.
——— tables of British, French and Russian ships, 420–429.
Comparison of relative strength of ships, 100–102.
Competitive plate trials, in Russia and United States, 286–288 (Plates II., III., IV., V.).
Composition of the fleet, changes in the, First Lord on, 373.
Compound armour, is it to be condemned? 291.
——— or steel-faced plates, 286.
Condor, Plate 56.
Conqueror, Plate 12.
Construction in progress abroad, 108.
——— expenditure on, of new vessels in England and France, 430.
——— in progress in Great Britain, 87–91.
——— of new ships, diagram showing expenditure, 430.
——— ———, new, expenditure, 400–406.
———, ships under, 1.
——— of standard types of guns, 304 (Plate XI.).
Contract ships, First Lord on, 352.
——— work 1891–92, estimates for, 387–389, 398, 399.
——— ——— under Naval Defence Act, First Lord on, 352.
Controller of the Navy, duties of, 44.
Conversion of measures, tables for the, 347, 348.
Conveyance of wounded, Naval manœuvres, 29.
Cordite powder, 320.
Cost of different classes of vessels added to fleet, 416.
Costly guns, desirability of testing, 302.
Couleuvrine, Plate 56.
Courbet, Plate 47.
Crescent, The, description of, 131, and Plate 15.
Cruisers, armoured, illustrations of, *Frontispiece*, 4, 53, 94.
——— building, 104.
——— consideration of future programme of construction, 112, 113.
——— first class, description of, 130.
——— protected, 90, 91.
——— ——— building for France, 138.
——— reserved merchant, list of, 186.
——— second class, remarks on, 133.
Curved steel plates, trial of, 292.
Cushing (United States), 4.

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Custody of Naval Ordnance, First Lord on, 365.
Custoza, Plate 32.
Cyclops, Plate 9.

D.

Dague, Plate 56.
Dandolo (Italian), Plates 69, 70.
Danish Naval ordnance, table of, 337.
——— ships, Plates 38, 39.
Dartmouth for a Naval School, 67.
Deck plates, Krupp's high angle trials at, 293.
Defective boiler tubes in English vessels, 57.
Defence Act, Naval, 87–96.
——— ——— Has it made England safe? 94.
Defence against invasion, duty of Navy, 98.
——— of coaling stations, 9, 83–86.
——— of the Empire, 98.
Delivery of ships, causes of delay, First Lord on, 352.
Denmark, list of ships of, 206, 207.
——— Merchant Marine of, 95.
——— Schneider's steel plates for, 292.
——— ships of, Plates 38, 39.
Depreciation, estimated annual rate of, 416.
Description of ships recently completed and in hand, 118–147.
Designs, modifications in, First Lord on, 355.
Deutschland (German), Plate 61.
Devastation, Plates 13, 47.
——— Whitworth's mounting for 10-inch Turret for, 308, (Plate XVII.).
——— ——— Recoil Brake and Running-up Gear for, 308, (Plate XVII.).
Diagram showing Expenditure on Construction of new ships, 430.
Diagrams perforation, 297, 298, (Plates VI., VII., VIII., IX.).
Dicey, Mr., on Naval Power, 59.
Difference of Estimates between 1890–91 and those of 1891–92, 385.
Dimensions of the battle-ships of the future, 109.
Dimensions, limit of, in battle-ships, 106.
Distribution of armour, 106.
——— of force in compiler's programme, 116.
Dock at Bombay, 9.
——— Gibraltar, 9.
——— Malta, First Lord on, 367.
Dockyard administration, *Engineer* on, 7.
——— ——— *The Times* on, 49.
——— built ships, First Lord on, 356.
——— services, miscellaneous, First Lord on, 358.
——— work, 1891–92, Estimates for, 387–389, 396.
——— workmen, general efficiency of, 56.
——— ——— increase of pay to, 55.
——— abroad, refits in, economy of, 55.
——— engines built in, 56.
——— improved results in, 3.
——— rapid construction in, 54.
Don Juan de Austria, Plate 32.
Dragonne, Plate 56.
Dreadnought, Plate 14.
Drill batteries for Naval Reserve, 68.
Duguesclin, Plate 49.
Duilio (Italian), Plates 69, 70.
Dupuy de Lôme (French), 2, and Plate 48.
Duquesne, Plate 57.
Dutch Naval ordnance, table of, 338.
Duty of the Navy, 97, 98.
Dvenadsat Apostoloff (Russian), 4.
Dynamite gun, Graydon's, 313.

E.

Eastern Trade, protection of, 99.
Easton & Anderson's muzzle-pivoting mounting, 310, 311, (Plates XVIII., XIX.).
Economies effected in recent ships, 8.
Economist on the Newfoundland Question, 80, 81.
Edgar class, Plate 15.
——— ——— description of, 130.
Edinburgh, Plate 11.
Education and training, 64–77.
Edwards, chief engineer, on training of Naval officers, 65.
Efficiency, Administrative, 49–58.

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Efficiency of dockyard workmen, 56.
Effective and non-effective ships, approximate aggregate cost of, 418.
Egypt, advantages of evacuation of, 79.
——— military occupation of, 78.
——— ships of, 208.
Elswick gun mounting, 308.
——— 110½-ton B. L. gun, 300, (Plate X.).
——— Guns, notes on, 303.
——— high angles breech-loading Howitzer and mounting, 306, (Plate XIII.).
——— Howitzer for high angle fire, 306.
——— mounting for the 29-ton guns in Thunderer, 308, (Plates XV., XVI.).
——— projectiles, 295.
——— quick-firing gun trials, 324–326.
Electric firing advocated, 326.
Electricity in the working of guns, 317.
Elements of sea power, 149.
Emmensite powder, 317.
Emperor Nicholas (Russian), Plate 79.
Empire, best means of the defence of the, 98.
Endymion, Plate 15.
Energy, table of, 348.
Engine-room space, 7.
Engineer in Chief, work of the, First Lord on, 360.
Engineer on dockyard administration, 7.
——— on the engineering branch of the Navy, 72, 73, 74.
Engineer staff, importance of duties of, 75.
Engineering contracts with private firms, 56.
Engineering on torpedo-boats' attack, 19.
Engineers and artificers, position of, 74.
——— grievances of, 73, 74.
——— insufficiency of numbers, 72, 73.
——— reserve of, 70.
——— training of, 71, 72.
Engines built in dockyards, 56.
——— for ships, sums paid for, to private firms, 56.
England and France, comparison of ships in construction in, 54.
——— ——— comparative expenditure in, 115.
——— France and Russia, relative strength of, 100–102.
——— sensitive of honour, 62.
English naval manœuvres, 11–32.
Entry of Naval officers, 65.
Esmeralda, Plate 36.
Esquimault, armaments for coaling station, 84.
Estimates, Navy, for the year, 1891–92, 382–430.
——— exceeded, reasons why, First Lord on, 362.
——— French Naval for 1892, 432–449.
——— German Naval, 1891–92, 452–455.
——— Italian Naval, 1891–92, 450.
——— revised, First Lord on, 357.
——— Russian Naval, 1891, 456.
——— United States Navy, 1891, 464.
Europe, war in 1779–82; note on, 151.
Evacuation of Egypt, advantages of, 79.
Expenditure, borne by each unit of fighting efficiency, 52.
——— comparative, in England and France, 115.
——— diagram showing, on construction of new ships, 430.
——— for Naval Services, actual and estimated, 384, 386.
——— Naval, necessity for, 117.
——— on construction of new vessels in England and France, 430.
——— on older ironclads recommended, 110.
——— on repairs, 55.
Experiments, armour, 283–299.
Explosion, premature, devices adopted to prevent, 319.
Explosives, Sir F. Abel on, 318.

F.

Failures in machinery, French manœuvres, 39.
Fast cruisers, want of, 25.
Fieramosca (Italian), 3.
Fighting efficiency, comparison of, 51.
——— ships laid down to build since 1885, 413–415.
Finance, new and old systems compared, First Lord on, 362.
Financial Secretary's explanatory observations on the Navy Estimates, 379, 380.

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Firing at armour, rules as to, 297.
——— programme of, on the Howe, 128.
——— projectiles, 295.
First-class battle ships, 102, 104.
——— ——— cruisers, description of, 130.
First Lord's statement of Navy Estimates, 351–375.
First Sea Lord, position of, 44.
Firth projectiles, 295.
Fiske's range-finder, 314–316, (Plate XX.).
Flamme, Plate 51.
Flèche, Plate 56.
Floating school of the Britannia, 66.
Foreign armoured and unarmoured ships, Tables of, 191–280.
——— commissions, length of, 77.
——— Naval manœuvres, 33–42.
——— policy, 78–82.
——— ——— change of, to Colonial policy, 60.
——— ——— First Lord on, 373.
——— shipbuilding, 91–94.
——— ships, Plates 31–95.
Forged steel projectiles, Holtzer's, 295, 296.
Formidable, Plates 40, 41.
Forth, Plate 23.
Forwood, Mr., at the Admiralty, 43.
——— ——— on transfer of ordnance stores, 46, 47.
France and England, comparative expenditure in, 115.
——— ——— comparison of ships in construction, 54.
——— changes in Navy administration, 8.
——— cruisers building for, 104.
——— dimensions adopted in ships, 109.
——— England and Russia, relative strength of, 100–102.
——— ironclads now constructing in, 53.
——— list of ships of, 209–223.
——— merchant marine of, 95.
——— naval administration of, 44.
——— Naval Estimates for 1892, 432–449.
——— naval manœuvres, 33–40.
——— position of in 1660 *et seq.*, 149.
France, proportion of Naval expenditure to revenue, 63.
——— relations with, Foreign Policy, 78.
——— ships building for, 91, 92.
——— ships building or to be built, 136–140.
——— ships launched, 2.
——— ships of, Plates 40–60.
——— training for mercantile marine, 71.
——— vessels most recently ordered, 108.
Francesco Morosini (Italian), Plate 68.
French, British and Russian ships, comparative tables of, 420–429.
——— coast defence vessels, remarks on, 111.
——— guns (perforations), 298, (Plate VIII.).
——— machinery, trials of, 57.
——— Naval Estimates, 1892, 432–449.
——— ——— manœuvres, 8–9, 33–40.
——— ——— ——— failures in machinery, 39.
——— ——— ——— lessons of, 37.
——— ——— ——— M. Weyl on, 38.
——— ——— ——— *United Service Gazette* on, 39.
——— ——— ordnance, table of, 339, 340.
——— Navy, ships building for, 91, 92.
——— ship-building, 53.
——— ships, Plates 40–60.
——— ——— building, or to be built, 136–140.
Friedrich der Grosse (German), Plate 61.
Furieux, Plate 50.
Fusée class, Plate 51.
Future policy of war-ship building, 97–117.
——— programme, necessity for discussing, 97.
——— ——— of ship building, 99.
——— prospects of English and foreign armour plates, 289.

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G.

Galatea, Plate 4.
Gambia and Sierra Leone, 82.
Garrisons for coaling stations, 84.
German guns (perforations), 298, (Plate IX.).
——— manœuvres, 40, 41.
——— Naval Estimates, 1891–92, 452–455.
——— ——— manœuvres, 9.
——— ——— ——— M. Weyl on, 40, 41.
——— ——— ordnance, table of, 341.
Germany, cruisers building for, 104.
——— list of ships of, 224–228.
——— merchant marine of, 95.
——— Naval administration of, 45.
——— proportion of Naval expenditure to revenue, 63.
——— ships building for, 92.
——— ships launched, 3.
——— ships of, Plates 61–66.
——— vessels most recently ordered, 108.
Gibraltar, Plate 15.
——— defence of coaling station, 83, 84.
——— dock at, 9.
Giovanni Bausan (Italian), Plate 73.
Glatton, Plate 14.
Gorgon, Plate 9.
Gorm, Plate 38.
Goubet, description and trials of the, 139.
Grafton, Plate 15.
Gravière, Admiral de la, on the qualifications required in Naval officers, 66.
Graydon's dynamite gun, 313.
Great Britain, description of ships recently completed, &c., 118–136.
——— ——— ships launched, 1.
——— ——— ships of, Plates 1–30.
——— ——— table of armoured ships, 156–166.
——— ——— table of unarmoured cruising ships, &c., 167–186.
Greece, list of ships of, 229, 230.
——— merchant marine of, 95.
——— ships launched, 5.
——— ships of, Plate 67.
Grenade, Plate 51.
Grievances of engineers, 73, 74.
Grozyashtchy (Russian), 4.
Grüson's experiments of 1890, 283.
——— shielded mounting, Tangerhütte trials, 284, (Plate I.).
——— system, quick-fire guns, 322–324.
Gun, 110½ ton, Elswick, B. L., 300, (Plate X.).
——— mounting, Elswick, 308, (Plates XV., XVI.).
——— ——— Whitworth, 309, (Plate XVII.).
——— positions in battle-ships, 105.
——— trials, quick fire, 324–326.
Gunnery, modern history of, 319.
——— M. Weyl on, 6.
——— practice, *Army and Navy Gazette* on, 13.
——— ——— *Broad Arrow* on, 13.
——— ——— Naval manœuvres, 12.
——— ——— of, 64.
——— trials of the Howe, 126–129.
Guns, Army and Navy, supplied by War Department, 1888–89, 332–335.
——— British, B. L. and M. L. (perforations), 298, (Plates VI., VII.).
——— disabled, Naval manœuvres, 13–14.
——— construction of standard types of, 304, (Plate XI.).
——— for drill purposes, Royal Naval Reserve, 377.
——— French and German (perforations), 298, (Plates VIII., IX.).
——— tables of British and foreign, 332–346.
——— working of, First Lord on, 363.
——— and projectiles in U. S., official report on, 316.
Gymnote, submarine boat, 7.
——— trials of the, 139.

H.

Hadfield projectiles, 295.
Halifax, dry dock at, First Lord on, 367.
Hamilton, Lord George, on work carried out under Defence Act, 87–89.

Digitized by Google

Hamilton's, Lord G., programme, 116.
——— objections to Naval control of coaling stations, 85.
Hard armour, notes on, 299.
Hawke, Plate 15.
Hayti, list of ships of, 231.
Health of the Navy, First Lord on, 369.
Heavy guns for battle-ships, 105.
——— ——— trials of, 303.
Hecate, Plate 9.
Helgoland, Plate 38.
Hercules, Plate 16.
Hero, Plate 12.
High-angle fire, Elswick howitzer for, 306, (Plate XIII.).
——— ——— howitzer battery, 306, (Plate XIV.).
——— ——— trials at deck plates, 293.
History, influence of sea-power on, 147–151.
——— of gunnery, modern, 319.
Hoche (French), 2, and Plate 52.
Holtzer's forged steel projectiles, 295, 296.
——— chrome steel projectiles, 317, 318.
Home hospitals, First Lord on, 369.
——— waters, operations in, Naval manœuvres, 19.
Hong Kong, defence of coaling station, 83.
Hood, Plate 17.
——— building of the, 54.
Hornby, Sir G., on fast cruisers, 25.
——— on promotion of warrant officers, 69.
——— on training of seamen, 64.
Hotspur, Plate 18.
Howe, Plate 10.
——— gunnery trials of the, 126, 129.
Howitzer battery, high-angle, 306, (Plate XIV.).
Hydra, Plate 9.
——— (Greek), Plate 67.
Hydraulic boat-hoisting machinery, 134–136.
——— mechanism, First Lord on, 364.

I.

Immortalité, Plate 4.
Impérieuse, Plate 19.
Inclined steel targets, experiments against, 294.
Increase in dimensions, reasons for, First Lord on, 354.
Indefatigable, Plate 3.
Indiana, U. S. battle-ship, description of, 142, and Plate 93.
Indian Marine, list of ships of, 189.
Indomitable, Plate 46.
Infanta Maria Teresa (Spanish), 6.
——— ——— ——— ——— description of, 141, and Plate 84.
Inflexible, Plate 20.
Influence of Naval power in modern times, 59–63.
——— ——— ——— on history, 147–151.
Inglis, General, perforation diagrams, 297.
Intelligence Branch, Admiralty, 45.
Intrepid, Plate 3.
Iphigenia, Plate 3.
Ironclads, coast defence, 103.
——— (French) at sea, behaviour of, 34.
——— ——— now constructing, 53.
Isle of Wight defences, Naval manœuvres, 29.
Isly, French protected cruiser, illustration of, 53, and Plate 58.
Italia (Italian), Plates 71, 72.
Italian Naval Estimates, 1891–92, 450.
——— Naval manœuvres, 41, 42.
——— Naval ordnance, table of, 342.
Italy, list of ships of, 232–236.
——— merchant marine of, 95.
——— Naval administration of, 45.
——— Naval policy adopted, 108.
——— proportion of Naval expenditure to revenue, 63.
——— ships building for, 92, 93.
——— ships of, Plates 68–74.
——— ships launched, 3.
——— vessels most recently ordered, 108.
Iver Hvitfeld, Plate 39.

Digitized by Google

J.

Japan, list of ships of, 237–239.
——— merchant marine of, 95.
——— ships launched for, 5.
Jamaica, defence of coaling station, 9, 83.
Jauréguiberry, French battle-ship, description of, 136, 137.
Jean Bart, Plate 58.
Jemmapes, Plate 43.

K.

Kaiser (German), Plate 61.
Kaiserin Elisabeth (Austrian), 5.
Katoomba, Australian protected cruiser, illustration of, *Frontispiece*, and Plate 21.
King George's Sound, defence of coaling station, 83.
Krupp's guns, note on, 303.
——— high-angle trials at deck plates, 293.

L.

Lance, Plate 56.
Langmaid, Chief Engineer, on training stokers, 74, 75, 76.
Languages, modern, encouragement of, by the Admiralty, 65.
La Manche (French), 2.
Latona, Plate 3.
Latouche-Treville, Plates 44, 45.
Length of foreign commissions, 77.
——— table for converting measures of, 347.
Lepanto (Italian), Plates 71, 72.
Léroy-Beaulieu on the Newfoundland question, 80, 81.
Lessons from Trafalgar, 148.
——— of French manœuvres, 37.
Lieutenants, Royal Naval Reserve, 70.
——— list, supplying deficiencies in, 69.
Limits of foreign stations, alterations in, First Lord on, 373.
Liverpool Journal of Commerce on education of Mercantile Marine, 71.
Longridge, Mr., on smokeless powder, 321.
Look-out ships, 109.

M.

Machinery of Royal Arthur, 133.
——— M. Weyl on, 6.
——— trials of French, 57.
Magazine arm, the, 327–329.
Magdala (Indian Marine), Plate 9.
Magenta (French), 2, and Plate 52.
Magicienne, Plate 22.
Mahan, Captain, foreign policy, 78.
——— ——— on the influence of sea power on history, 147 *et seq.*
Mahan's, Captain, work on the Naval power of the country, 59.
Maine, American armoured cruiser, illustration of, 4, and Plate 91.
Maitland's, General, perforation diagrams, 298.
Malta defence of coaling station, 83, 84.
——— new dock at, First Lord on, 367.
Manœuvres, Naval, English, 11–32.
——— ——— foreign, 33–42 (see Naval manœuvres).
Manning of steam branch of Navy, 71.
——— ships, increased demands for, First Lord on, 370.
——— the Navy, 67.
Map of the world, showing coaling stations, &c., 84.
Marathon, Plate 22.
Marceau (French), 2, and Plate 52.
Marco Polo (Italian), 3.
Marines, the, for coaling stations, 86.
Massachusetts, U. S. battle ship, description of, 142, and Plate 93.
Materiel, 1891–92, Estimates for, 387–389, 397.
Mathematical knowledge in the Navy, 66.
Mauritius, defence of coaling station, 83.
Mayne, Admiral, on training of Naval officers, 65.

Digitized by Google

Mayo, the 25th de, Argentine cruiser, description of, 144, 145.
Measured mile trials, First Lord on, 360.
Measures, tables for the conversion of, 347, 348.
Medea, Plate 22.
Mediterranean, defence of coaling station, 9.
Medusa, Plate 22.
Medway facilities, First Lord on, 368.
Melampus, Plate 3.
Melinite, accidents with, 319.
Melpomene, Plate 22.
Memorandum, Sir G. Tryon's, Naval manœuvres, 15.
Mercantile auxiliaries, 115.
——— marine, college for, 71.
——— ——— in France, training for, 71.
——— ——— training of, 70.
Merchant cruisers, reserved, list of, 186.
——— marine, table showing distribution of, 95.
Mersey class, Plate 23.
Meteor (German), 3.
Mexico, list of ships of, 240.
——— training ship for, 5.
Mildura (Australian cruiser), Plate 21.
Military occupation of Egypt, 78.
Minin (Russian), Plate 80.
Minor armament, protection of, 106.
Mitraille, Plate 51.
Mobilisation and manning, First Lord on, 368.
Modern history of gunnery, 319.
——— languages, encouragement of, by the Admiralty, 65.
——— working of ordnance, 320.
Monitors, remarks on, 111.
Monterey, freeboard monitor for the U. S., 142, 143.
Morin, Signor, on ships of different types, 115.
Mounting, Whitworth's, for the 10-inch turret of H.M.S. Devastation, 308, (Plate XVII.).
Mountings for new armaments, H.M.S. Thunderer, &c., 308.
Muzzle-pivoting mounting, 310, 311, (Plates XVIII., XIX.).

N.

Naiad, Plate 3.
Napoleon foiled by Nelson, 148.
——— on British maritime force, 79.
Narcissus, Plate 4.
National insurance, 61.
Naval administration, 43–48.
——— ——— abroad, 44.
——— ——— Austria, 45.
——— ——— British, superior economy of, 52.
——— ——— France, 8, 44.
——— ——— Germany, 45.
——— ——— Italy, 45.
——— armaments, 1891–92, estimates for, 390.
——— Artillery Volunteers, 70.
——— control of coaling stations, 84, 85.
——— Defence Act, 87–96.
——— ——— ——— First Lord on, 361.
——— Department, Washington, on advantages of numbers, 107.
——— Estimates for year 1891–92, 382–430.
——— ——— French, 1892, 432–449.
——— ——— German, 1891–92, 452–455.
——— ——— Italian, 1891–92, 450.
——— ——— Russian, 1891, 456.
——— ——— United States, 1891, 464.
——— expenditure, British, compared with military expenditure of foreign powers, 49.
——— ——— cost per man of, 52.
——— ——— on repairs, 55.
——— ——— proportions of, to revenue, at home and abroad, 63.
——— expense, necessity for, 117.
——— Gunnery Establishment, Whale Island, First Lord on, 367.
——— manœuvres, 8, 9.
——— ——— *Army and Navy Gazette* on, 24.
——— ——— coal consumption, 17.
——— ——— coaling at sea, 18, 26.
——— ——— colliers, 17, 18.

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Naval manœuvres, conveyance of wounded, 29.
——— ——— *Engineering* on torpedo-boat's attack, 19–21.
——— ——— English, 11–32.
——— ——— ——— forces engaged in, 12.
——— ——— Foreign, 33–42.
——— ——— French, 8–9, 33–40.
——— ——— German, 9, 40, 41.
——— ——— gunnery practice and steam tactics, 12.
——— ——— guns disabled, 14.
——— ——— Isle of Wight defences, 29.
——— ——— Italian, 41, 42.
——— ——— lessons to be drawn from, 25.
——— ——— M. Weyl on, 8, 28.
——— ——— Needles operations, 29–32.
——— ——— operations in home waters, 19 *et seq.*
——— ——— position of respective forces, 16.
——— ——— principal object of, 14.
——— ——— scouting operations, 16.
——— ——— Sir G. Hornby on, 25.
——— ——— Sir G. Tryon's memorandum, 15.
——— ——— torpedo-boat operations, 19, 21, 26, 27.
——— ——— *United Service Gazette* on, 22, 24, 29.
——— mountings, employment of electricity in working guns, 317.
——— officers, entry of, 65.
——— ——— qualifications required in, 66.
——— ——— training of, 65.
——— ordnance, Austrian, table of, 336.
——— ——— custody of, First Lord on, 365.
——— ——— Danish, table of, 337.
——— ——— Dutch, table of, 338.
——— ——— French, table of, 339, 340.
——— ——— German, table of, 341.
——— ——— Italian, table of, 342.
——— ——— Norwegian, table of, 345.
——— ——— Russian, table of, 343.
——— ——— Spanish, table of, 344.
Naval ordnance, Swedish, table of, 345.
——— ——— United States, table of, 346.
——— ——— stores, custody of, First Lord on, 374.
——— power, influence of, in modern times, 59–63.
——— reserve, 69.
——— ——— additional pay for, 68.
——— ——— Admiral Tryon's report on, 376.
——— ——— drill batteries for, 68.
——— ——— First Lord on, 370.
——— ——— necessity for organising, &c., 67, 68.
——— reserved merchant cruisers, list of, 186.
——— school at Dartmouth, 67.
——— service, total estimated expenditure, 386, 400.
——— services, actual and estimated expenditure, 384.
——— stokers, training of, 74, 75, 76.
Navies, relative strength of, 95, 96.
Navy, additions to 1891–92, 89.
——— command of sea to C. Finisterre, 98.
——— defence of coaling stations depends on, 83.
——— dependence of the British Empire on the, 60.
——— engineers and artificers, position of, 74.
——— grievances of engineers, 73, 74.
——— health of, First Lord on, 369.
——— insufficiency of engineers, 72, 73.
——— manning the, 67.
——— necessity for organising a reserve for, 67.
——— number of stokers required for, 76.
——— steam branch, manning of, 71.
——— strength of, upon completion of Hamilton programme, 116.
——— to give protection to British commerce, 98.
——— training of engineers, 71, 72.
——— training of stokers, 74, 75, 76.
——— twofold duty of, 97, 98.
——— estimates for the year 1891–92, 382–430.

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Navy estimates, explanatory observations by Financial Secretary, 379, 380.
——— ——— First Lord's statement, 351–375.
Necessity for ships of different types, 115.
Needles operations, naval manœuvres, 29–32.
Nelson, Plate 24.
Neptune, Plates 24, 52.
Netherlands, list of ships of, 241–245.
——— merchant marine of, 95.
——— ships of, Plate 75.
Nettle trials, 285.
Neutral flag, transfer to, 98.
New armaments, mountings for, 308.
——— construction, expenditure, 400–406.
——— ——— First Lord on, 351.
——— ——— re-construction, repairs, &c., 1891–92, General Summary, 408.
——— ironclads A and C (German), Plate 65.
——— ships, diagram showing expenditure upon the construction of, 430.
——— ——— and vessels for First reserve, 412.
——— type boilers, First Lord on, 359.
——— works, First Lord on, 367.
——— York, armoured cruiser for the U. S., description of, 143.
Newark (U. S. ship), 4, and Plate 92.
Newfoundland question (foreign policy), 80, 81.
Nickel, Canadian, 290.
——— from the Oregon mines, 290.
——— use of, in manufacture of armour, 6.
——— steel Schneider plate, 287, 288.
Nicolai (Russian), Plate 81.
Nile, Plate 30.
——— steam trial of, 123–126.
——— and Trafalgar, description of, 119.
Noble's, Capt., address to British Association, on Gunnery, 319.
Non-effective ships, list of, 188.
Northampton, Plate 24.
Norway, list of ships of, 246–248.
——— merchant marine of, 95.
Norwegian Naval Ordnance, table of, 345.
N.W. Coast of Africa, the new station, First Lord on, 373.

O.

Oblique fire, rule as to, 297.
Ocean, patrol of, 98.
Ochta competitive trials of armour, 288, (Plates IV., V.).
Offensive strength of England, 59.
Officers and men of Royal Naval Reserve, numbers of, 376–378.
——— ——— locked up, First Lord on, 370.
Old programme, ship building, vessels laid down under, 89.
Oldenburg (German), Plate 62.
Older ironclads, expenditure on, recommended, 110.
Ordnance, 300–348.
——— Austrian Naval, table of, 336.
——— British rifled, table of, 334, 335.
——— Canet and other French, 304.
——— Danish Naval, table of, 337.
——— Dutch Naval, table of, 338.
——— French Naval, table of, 339, 340.
——— German Naval, table of, 341.
——— Italian Naval, table of, 342.
——— Norwegian Naval, table of, 345.
——— Russian Naval, table of, 343.
——— Spanish Naval, table of, 344.
——— Swedish Naval, table of, 345.
——— United States Naval, table of, 346.
——— and armour, 283–348.
——— Board, history of, 47, 48.
——— modern working of, 320.
——— stores, Mr. Forwood on, 46–47.
——— ——— Sir A. Adye on, 47.
——— ——— transfer of, 46–48.
Oregon, U. S. battle ship, description of, 142, and Plate 93.
——— mines, nickel from, 290.
Orion, Plate 6.
Orlando, Plate 4.

P.

Pallas, third class protected cruiser, 133, 134.
Pamyat Azova, Russian armoured cruiser, illustration of, 94, and Plate 82.

Digitized by Google

Patrol of Ocean, 98.
Pay, increase of, to dockyard workmen, 55.
——— for Naval Reserve men, 68.
Pelayo (Spanish), Plate 85.
Peral, trials of the, 139.
Perforation diagrams, 297, 298, (Plates VI., VII., VIII., IX.).
Persia, list of ships, 249.
Personnel, recent additions to, First Lord on, 370.
Peru, note on Navy of, 248.
Petroleum, burning of, in war ships, 3.
Phlégéton, Plate 51.
Pique, Plate 3.
Plate-firing, problems in, worked mechanically, 298.
——— trials, competitive, in Russia and United States, 287, 288.
Policy, foreign, 78–82.
——— strictly defensive, 117.
Polyphemus, remarks on, 112.
Portugal, list of ships of, 249–251.
——— ship-building prospects, 5.
Positions of guns in battle ships, 105.
Powder, amide, 319.
——— brown, 317.
——— cordite, 320.
——— emmensite, 317.
——— smokeless, Mr. Longridge on, 321.
Premature explosion, devices adopted to prevent, 319.
Pressure, table of, 348.
Preussen (German), Plate 61.
Price, Capt., on promotion of warrant officers, 69.
Princess Wilhelmina (Netherland ship), Plate 75.
Principles of war remain the same in spite of other changes, 147.
Private property at sea, capture of, 62.
Programme, a five years', compiler's suggested, 116.
——— future, 99.
——— of British shipbuilding, &c., Estimates, 392 *et seq.*
——— of shipbuilding under Defence Act, 87.
Projectiles, forged steel, 295.
——— and shields, Holtzer's, 318.
Promotion of warrant officers to commissioned rank, 69.
Propelling machinery, manufacture of, First Lord on, 357.
Proportion of Naval expenditure to revenue, 63.
Protected cruisers, 103.
——— ——— building for France, 138.
Protection of commerce, 95.
——— ——— duty of Navy, 98.
——— of minor armament, 106.
Psara (Greek), Plate 67.

Q.

Quebec, capture of, 150.
Quick-fire gun trial, Elswick, 324–326.
——— guns, Grüson's system, 322–324.
——— trial, 320, 321.
Quick firing armaments, 105.
——— guns and small arms, 322–329.

R.

Rainbow, Plate 3.
Ramillies, description of, 118–122, and Plate 25.
Rams, remarks on, 112.
Range-finder, Fiske's, 314–316, (Plate XX.).
Rapidity of fire with large guns, test of, First Lord on, 365.
Re Umberto (Italian), 3.
Recapitulation of estimated expenditure, 400.
Recoil brake and running-up gear, Whitworth's, 308, (Plate XVII.).
Reconstruction, First Lord on, 358.
Redoutable, Plate 47.
Refits, First Lord on, 358.
——— in dockyards abroad, economy of, 55.
Reina Regente (Spanish), Plate 86.
Relations with France, foreign policy, 78.
Relative strength, comparison of ships, 100–102.
——— ——— of navies, 95, 96.

Digitized by Google

Renown, description of, 118-122, and Plate 25.
Repairs, expenditure on, 55.
Repulse, description of, 118–122, and Plate 25.
Requin (French), 2, and Plate 46.
Reserve, Naval, 69.
——— ——— drill batteries for, 68.
——— necessity for organising a, for the Navy, 67, 68.
Reserved merchant cruisers, list of, 186.
Resolution, description of, 118–122, and Plate 25.
Retention of sail power, 114.
Retribution, Plate 3.
Revenge, description of, 118–122, and Plate 25.
Révue du Cercle Militaire on offensive strength in England, 59.
Riachuelo, Plate 34.
Richelieu, Plate 53.
Rifled Ordnance, British, table of, 334, 335.
Ringarooma (Australian cruiser), Plate 21.
Rodney, Plate 10.
Royal Arthur, description of, 130–133, and Plate 15.
——— ——— rapid building of, 54.
——— Naval Artillery Volunteers, 70.
——— ——— Reserve, Admiral Tryon's report on, 376.
——— ——— ——— First Lord on, 370.
——— ——— ——— number of officers and men, 376–378.
——— ——— reserved merchant cruisers, list of, 186.
——— Oak, description of, 118–122, and Plate 25.
——— Sovereign, building of the, 54.
——— ——— description of, 118–122, and Plate 25.
Roumania, note on Navy, 252.
Ruggiero di Lauria (Italian), Plate 68.
Running-up gear (Whitworth's), 308, (Plate XVII.).
Rupert, Plate 18.
——— muzzle-pivoting, mounting for, 310, (Plates XVIII., XIX.).
Russia, competitive armour plate trials in, 287, 288.
Russia, cruisers of, 104.
——— England and France, relative strength of, 100–102.
——— list of auxiliary steamers, 260.
——— list of ships of, 253–260.
——— merchant marine of, 95.
——— Naval administration, 45.
——— proportion of Naval expenditure to revenue, 63.
——— relations with, foreign policy, 79.
——— ships building for, 93, 94.
——— ships launched, 3, 4.
——— ships of, Plates 76–83.
——— Skobeloff on national sentiment in, 79.
——— vessels most recently ordered, 108.
Russian, British and French ships, comparative table of, 420, 429.
——— Naval estimates, 1891, 456.
——— Naval ordnance, table of, 343.

S.

Sachsen (German), Plates 63, 64.
Sail power, retention of, 114.
Sailing ships for training, value of, 64.
Saint George, Plate 15.
Sainte-Barbe, Plate 56.
Salve, Plate 56.
Sanspareil gun, 300.
Sans Pareil, Plate 26.
Sappho, Plate 3.
Sarawak, lists of ships of, 261.
Schneider plate, nickel-steel, 287.
Schneider's solid steel armour, 285.
——— steel plates for Denmark, 292.
Schumann, Colonel, and shielded mountings, 284.
Scouting operations, naval manœuvres, 16.
Scylla, Plate 3.
Sea power, Captain Mahan on, 59.
——— elements of, 149.
——— on history, influence of, 147–151.
Second-class battle-ships, 103, 104.
——— ——— description of, 122, 123.
——— cruisers, remarks on, 133.
——— protected cruisers building for France, 138.

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Seven Years' War, The, 150.
Severn, Plate 23.
Sfax, Plates 59, 60.
Shannon, Plate 27.
Shielded mountings and quick-fire guns, experiments, 283.
——— ——— Grüson's, Tangerhütte trials, 284, (Plate I.).
Shields, Holtzer's, 318.
Shipbuilding, abroad, 91–94.
——— for foreign powers, 2–6.
——— French, 53.
——— programme of, under Defence Act, 87.
——— ——— estimates, 392 *et seq.*
——— prospects, Portugal, 5.
——— repairs, &c., Estimate for 1891–92, 387–389.
Ships, armoured, Great Britain, table of, 156–166.
——— British, Plates 1–30.
——— building, completing, and to be commenced in H.M. dockyards and by contract during the year 1891–92, summary of, 410.
——— ——— 1891–92, Estimates for, 392–400.
——— ——— or to be built for the Argentine Republic, 144–146.
——— ——— for France, 136–140.
——— ——— for French Navy, 91, 92.
——— ——— for Germany, 92.
——— ——— for Italy, 92, 93.
——— ——— for Russia, 93, 94.
——— ——— for Spain, 141.
——— ——— or to be built for the United States, 141–144.
——— constructed for the Argentine Republic, 5.
——— engaged in naval manœuvres, France, 33.
——— foreign, Plates 31–95.
——— in commission, increase of, First Lord on, 369.
——— in construction, comparison of, in France and England, 54.
——— launched, Austria, 5.
——— ——— Brazil, 5.
——— ——— Chili, 5.
——— ——— France, 2.
——— ——— Germany, 3.
——— ——— Great Britain, 1.
Ships launched, Greece, 5.
——— ——— Italy, 3.
——— ——— Japan, 5.
——— ——— Russia, 3, 4.
——— ——— Spain, 6.
——— ——— United States, 4.
——— non-effective, list of, 188.
——— of Colonial Marine, 190.
——— of the Indian Marine, list of, 189.
——— on commission, new arrangements made for charge of, First Lord on, 373.
——— recently completed and in hand, 118–147.
——— unarmoured, Great Britain, table of, 167–186.
——— under construction, 1.
——— under Naval Defence Act of 1889, First Lord on, 356.
Siam, ships of, 261.
Sicilia (Italian), Plate 74.
Siegfried (German), 3, and Plate 66.
Sierra Leone, little value of, 82.
Signal stations, First Lord on, 368.
——— mobilised, First Lord on, 368.
Singapore, defence of coaling station, 9, 83.
Sinope (Russian), 4, and Plates 77, 78.
Sirène, submarine boat, 7.
Sirius, Plate 3.
Skobeleff, on national sentiment in Russia, 79.
Slide-rule, Major Willoughby's, 298.
Smokeless powder, Mr. Longridge on, 321.
——— ——— notes on, 318, 319.
Solid steel armour, Schneider's, 285.
South America, new command in, First Lord on, 374.
South American trade, protection of, 99.
Spain, list of ships of, 262–267.
——— merchant marine of, 95.
——— ships building for, 141.
——— ships launched, 6.
——— ships of, Plates 84–86.
Spanish Naval ordnance, table of, 344.
——— succession, war of, Captain Mahan on, 150.
Spartan, Plate 3.
Speed, remarks on, 104.
——— and coal supply, 104.

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Spetsia (Greek), Plate 67.
St. Helena, defence of coaling station, 83.
St. Lucia, defence of coaling station, 9, 83.
Standard types of guns, construction of, 304, (Plate XI.).
Standards for dimensions of battle-ships in United States, 108.
Statement of First Lord on Navy Estimates, 351–375.
Statistics, official statement, &c., 351–464.
Steam branch of Navy, manning of, 71.
——— tactics, Naval manœuvres, 12.
——— trials, First Lord on, 353, 358.
——— ——— of the Achilles, 130.
Steel armour, 285.
——— ——— First Lord on, 366.
——— faced plates, 286.
——— plate, Vickers's, 288.
——— plates, Chrome, 296.
——— ——— curved, trial of, 292.
——— ——— for Denmark, 292.
——— projectiles, Chrome, Holtzer's, 317, 318.
——— ——— Holtzer's, 295, 296.
——— targets, inclined, experiments against, 294.
Stokers employed on deck, 77.
——— number required for Navy, 76.
——— to be drilled as combatants, 77.
——— training of, 74, 75, 76.
Strategic lessons permanent, 148.
Strength, relative, of Navies, 95, 96.
Submarine boats, 7, 139, 140.
Sultan, Plate 28.
Superb, Plate 28.
Surcouf (French), 2.
Sweden, additions to Navy, 6.
——— list of ships of, 268–270.
——— merchant marine of, 95.
Swedish Naval ordnance, table of, 345.
Swiftsure, Plate 29.
Sybille, Plate 3.
Sydney, works at, First Lord on, 367.

T.

Table giving descriptions of first class battle-ships now building, 119.
——— of armoured ships, Great Britain, 156–166.
——— of Austrian Naval ordnance, 336.
——— of British rifled ordnance, 334, 335.
——— of Danish Naval ordnance, 337.
——— of Dutch Naval ordnance, 338.
——— of French Naval ordnance, 339, 340.
——— of German Naval ordnance, 341.
——— of Italian Naval ordnance, 342.
——— of Norwegian Naval ordnance, 345.
——— of Royal Naval reserved merchant cruisers, 186.
——— of Russian Naval ordnance, 343.
——— of ships of colonial marine, 190.
——— of ships of the Indian marine, 189.
——— of Spanish Naval ordnance, 344.
——— of Swedish Naval ordnance, 345.
——— of unarmoured cruising ships, Great Britain, 167–186.
——— of United States Naval ordnance, 346.
——— of vessels to be completed in U. S. Navy in 1893, 458.
——— showing distribution of merchant marine, 95.
——— showing ironclads now constructing in France, 53.
——— showing Naval expenditure on repairs, 55.
——— showing programme of firing on the Howe, 128.
——— showing ships building and completing in France and England, 54.
Tables, comparative, of British, French, and Russian ships, 420–429.
——— for the conversion of measures, 347, 348.
——— of British foreign armoured and unarmoured ships, 153–280.
——— of British and foreign guns, 332–346.

Digitized by Google

Tables of foreign armoured and unarmoured ships, 191–280.
——— showing relative strength of England, France, and Russia, 100–102.
Tage (French), 2.
Tangerhütte trials with Grüson's shielded mountings, 284, (Plate I.).
Tauranga (Australian cruiser), Plate 21.
Tchsmé (Russian), Plates 77, 78.
Tegetthoff, Plate 33.
Temeraire, Plate 29.
Terpsichore, Plate 3.
Terrible, Plate 46.
Testing costly guns, desirability of, 302.
Texas (U. S. ship), Plate 94.
Thames, Plate 23.
The "25th de Mayo," Argentine cruiser description of, 144, 145.
Theseus, Plate 15.
Thetis, Plate 3.
Thickness of armour, 106.
Thin armour, First Lord on, 354.
Third class protected cruisers, remarks on, 133.
Thunderer, Plate 13.
——— Elswick mounting for 29 ton guns for, 308, (Plates XV., XVI.).
——— trials of new armament, 130.
Times, The, on efficiency of dockyard administration, 49.
——— on German manœuvres, 41.
——— on the gunnery trials of the Howe, 126–129.
——— on hydraulic boat-hoisting machinery, 134–136.
——— on the launch of the Royal Arthur, 130, 131.
——— on steam trial of the Nile, 123–126.
Ting Yuen, Plate 37.
Torpedo boat operations, Naval manœuvres, 19, 21, 26, 27.
——— boats for the Argentine Republic, description of, 145, 146.
——— ——— remarks on, 110, 111.
——— flotilla, France, list of, 223.
——— gunboats, note on, now constructing, 91.
——— gun vessels as auxiliaries to battle ships, 109.
Torres Strait, defence of coaling station, 83.
Toulon, ship repairs at, 55.
——— visit of Mediterranean squadron to, 10.
Tracy's, General, report on U. S. Navy, 4.
Trade routes, map showing, 84.
Trafalgar, Plate 30.
——— lessons from, 148.
——— and Nile, description of, 119.
Trained men in reserve, First Lord on, 370.
Training and education, 64–77.
——— of engineers, 71, 72.
——— of Naval officers, 65.
——— of officers in merchant service in United States, 70.
——— of seamen, Admiral Hornby on, 64.
——— ship for Mexico, 5.
——— ——— for the north, First Lord on, 372.
——— time for, First Lord on, 371.
——— value of sailing ships for, 64.
Transfer of ordnance stores, 46–48.
——— to neutral flag, 61, 98.
Tréhouart, Plate 43.
——— class, ships of the, building, 137, 138.
Trials of armour, competitive, 286–288 (Plates II., III., IV., V.).
——— of French machinery, 57.
——— of heavy guns, 303.
——— review of, during the year, First Lord on, 360.
——— Tangerhütte, with Grüson's shielded mountings, 284, (Plate I.).
Tribune, Plate 3.
Trident, Plate 54.
Triumph, Plate 29.
Trooping service, wasteful expenditure on, 58.
Troude (French), 2.
Tryon, Sir G., Naval manœuvres, 15, 21, 22, 24.
——— on national insurance, 61.
——— report on the Royal Naval Reserve, 376.
Turkey, additions to Navy, 6.
——— list of ships of, 271–273.
——— merchant marine of, 95.

Digitized by Google

Types of ships, consideration of, 104.
——— qualities of, under construction, 90.
——— standard of guns, 304 (Plate XI.).

U.

UNARMOURED ships, Argentine Republic, list of, 193.
——— ——— Austria, list of, 195, 196.
——— ——— Brazil, list of, 199–200.
——— ——— Chili, list of, 202.
——— ——— China, list of, 204, 205.
——— ——— Denmark, list of, 207.
——— ——— Egypt, list of, 208.
——— ——— France, list of, 214–223.
——— ——— Germany, list of, 226–228.
——— ——— Great Britain, list of, 167–186.
——— ——— Greece, list of, 230.
——— ——— Hayti, list of, 231.
——— ——— Italy, list of, 234–236.
——— ——— Japan, list of, 238, 239.
——— ——— Mexico, list of, 240.
——— ——— Netherlands, list of, 243–245.
——— ——— Norway, list of, 247, 248.
——— ——— Portugal, list of, 250, 251.
——— ——— Roumania, list of, 252.
——— ——— Russia, list of, 256–260.
——— ——— Sarawak, list of, 261.
——— ——— Siam, list of, 261.
——— ——— Spain, list of, 264–267.
——— ——— Sweden, list of, 269, 270.
——— ——— Turkey, list of, 272, 273.
——— ——— United States, list of, 276–279.
——— ——— Uruguay, list of, 280.
——— ——— Venezuela, list of, 280.
Undaunted, Plate 4.
United Service Gazette, French manœuvres, 39.
——— ——— ——— on grievances of engineers, 73.
——— ——— ——— on naval manœuvres, 16, 17, 22, 24, 29.
United Service Gazette on the Needles operations, 29.
——— ——— ——— on submarine boats, 139.
United States, battle ships for, 4.
——— ——— competitive plate trials in, 287.
——— ——— engineers in, 72.
——— ——— General Tracy's report on Navy of, 4.
——— ——— list of ships of, 274–279.
——— ——— merchant marine of, 95.
——— ——— naval ordnance, table of, 346.
——— ——— ship launched, 4.
——— ——— ships building or to be built for the, 141–144.
——— ——— ships of, Plates 87 to 95.
——— ——— standards for dimensions of battle-ships, 108.
——— ——— training of officers in merchant service, 70.
——— ——— vessels most recently ordered, 108.
——— ——— vessels to be completed in 1893, table of, 458.
——— ——— Navy, official report of progress in manufacture of guns and projectiles, 316.
——— ——— ——— estimates 1891, 464.
——— ——— ——— programme of, 108.
——— ——— ——— report of the secretary of, 457–464.
Uruguay, list of ships of, 280.

V.

VALMY, Plate 43.
Venezuela, ship of, 280.
Vertical fire, experiments with, 307.
Vessels recently ordered by foreign administrations, 108.
——— to be completed in 1893 in United States, 458.
Vickers' steel plate, 288.
Victoria, Plate 26.
Viscaya (Spanish), description of, 141, and Plate 84.
Vitu expedition, 9.

Digitized by Google

Vladimir Monomach (Russian), Plate 83.
Vulcan, hydraulic boat-hoisting gear in, 134–136.

W.

Wages, workmen's, First Lord on, 363.
Wallaroo (Australian cruiser), Plate 21.
War in Europe, 1779–82, note on, 151.
——— of American Revolution, note on, 151.
——— of 1778, note on, 151.
——— of Spanish succession, Captain Mahan on, 150.
Warrant officers, promotion of, to commissioned rank, 69.
War-ship building, future policy of, 97–117.
Warspite, Plate 19.
Wasteful expenditure on trooping service, 58.
Weight, table for converting measures of, 347.
Weyl, M., on administrative changes in France, 8.
——— on French Naval manœuvres, 38.
——— on French torpedo boats, 40.
——— on German manœuvres, 40, 41.
——— on gunnery, 6.
——— on the history of the year 1890, 2.
——— on improved results in dockyards, 3.
Weyl, M., on machinery, 6.
——— on Naval manœuvres, 8, 28.
——— on the Newfoundland question, 81.
——— on the use of nickel, 6.
——— on Russian ships launched, 4.
Whale Island Barracks, First Lord on, 367.
Whitehead torpedoes, First Lord on, 365.
Whitworth gun mounting, 309.
Whitworth's mounting for the 10-inch turret guns for Devastation, 308, (Plate XVII.).
——— recoil brake and running-up gear in Devastation, 308, (Plate XVII.).
Willoughby's, Major, slide-rule, 298.
Wilson's compound or steel-faced plates, 286.
Working of guns, First Lord on, 363.
Workmen's wages, First Lord on, 363.
Works in progress, ships building, 1891–92, estimates for, 392–400.
Wounded, conveyance of, Naval manœuvres, 29.

Y.

York Town (U. S. ship), Plate 95.

Z.

Zanzibar, rapid mobilisation of force, 9, 10.

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